Technical Documentation

Sound Analysis Software BZ 7210/BZ 7219 and Enhanced Sound Analysis Software BZ 7206

Brüel & Kjær

Sound Analysis Software BZ 7210/ BZ 7219 and Enhanced Sound Analysis Software BZ 7206

For
Modular Precision Sound Analyzer 2260 Investigator
From serial no. 1 772 136 with
BZ 7206 (Software Version 2.0 or 2.1)
BZ 7210 (Software Version 2.0)
BZ 7219 (Software Version 1.0)

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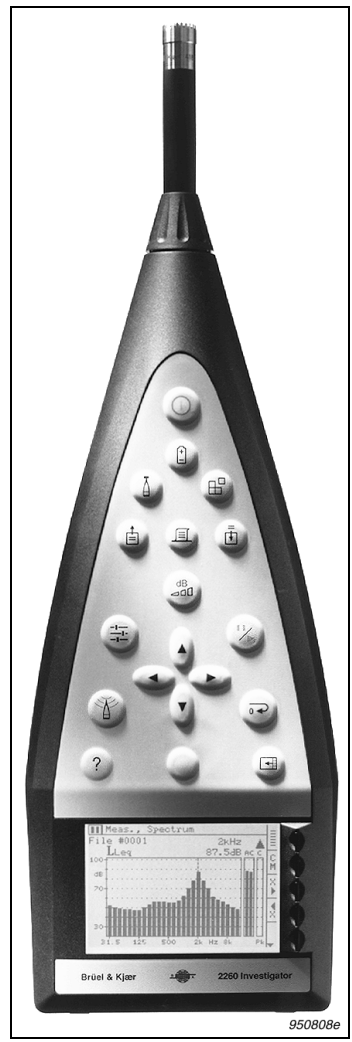
1.1 Welcome



This manual describes software applications that run on 2260 Observer instruments and on 2260 Investigator instruments.

A number of functions are only available on the 2260 Investigator running BZ 7206. This is pointed out in each case.

Note that a 2260 Observer can be factory upgraded to a 2260 Investigator, thus providing access to this instrument's full range of advanced applications such as building acoustics (one- and two-channel), sound intensity, and FFT analysis.

The Analyzer

The analyzer (right) comprises the following:

- Modular Precision Sound Analyzer Type **2260 Investigator™** (platform) with Sound Analysis Software BZ 7210
  or
  Modular Precision Sound Analyzer Type **2260 Observer** (platform) with Sound Analysis Software BZ 7219
- Enhanced Sound Analysis Software BZ 7206 (for 2260 Investigator only)
- Input Stage ZC 0026

- Microphone Type 4189

With this combination you'll have a powerful instrument indispensable for making serious measurements and analyses of noise.

This particular combination of software and platform is aimed at markets primarily concerned with environmental requirements.

Experienced users and beginners alike will appreciate this powerful hand-held instrument, both in the field and back in the laboratory. You'll be in possession of easy-to-use facilities for handling results and viewing data both during and after a measurement.

The Software that Saves you Time and Money

Main differences between the software types are:

- BZ 7219: Sound Analysis Software for 2260 Observer
- BZ 7210: Sound Analysis Software for 2260 Investigator as BZ 7219, plus Charge Injection Calibration check
- BZ 7206: Enhanced Sound Analysis Software for 2260 Investigator as BZ 7210 plus Spectral Statistics, Measurement Sequence, Event Logging with trigger facilities and editing of markers

Note: unless otherwise stated, all instructions and references to "software" throughout this manual refer to BZ 7219, BZ 7210 and BZ 7206.

As soon as you start using the software (see next section for how to load), you will appreciate its most important feature, that is, everything you set it up to measure, it measures concurrently. And that saves you a lot of time and money.

This is possible because the software exploits the enormous computing power of the platform to measure, analyse and record all parameters and information in the time it takes to make a single measurement. Quite simply, this means, you have the results as soon as the measurements are over.

No longer do you have to demand repeatable steady-state conditions when making extensive measurements, even for spectral analyses.

Installing Software

Sound Analysis Software BZ 7210 is pre-installed on 2260 Investigator and BZ 7219 is pre-installed on 2260 Observer. When you switch it on for the first time, the user interface language will be English.

To change the language or to install Enhanced Sound Analysis Software BZ 7206 on 2260 Investigator you need to switch off the 2260 and connect it to a PC using Serial Cable AO 1442 (or AO 1386), then switch the PC on, insert the CD-ROM BZ 5298 in the PC's CD-ROM drive and finally, select "Applications" and "Software for Type 2260". If the installation software doesn't start up automatically then run the file Set-up.exe on the CD-ROM.

The installation software will guide you through the installation process.

1.2 Noise Measurement Parameters

The software is for measuring a comprehensive set of parameters used in rating noise in terms of its impact on the domestic and working environments.

The more commonly used of these, which cover a large range of applications, are (see also sections 2.3.2 and 2.3.3):

- Sound Pressure Levels
- Equivalent Continuous Levels
- Peak Levels
- Percentile Levels
- Taktmaximal (3 s and 5 s)
- Sound Exposure Levels

In addition there is a choice of:

- A, C and L frequency weightings
- Fast, Slow and Impulse time weightings

The sound analysis software provides five ways of viewing your data:

- Discrete sound-level-meter parameters
- Cumulative distribution
- Level distribution
- Octave-band spectrum or $^1/_3$-octave band spectrum
- 15- or 60-second sound-level profile

1.3 How the Analyzer Works

A Dedicated Sound Measurement Platform

Modular Precision Sound Analyzer Type 2260 is a programmable platform for a dual-channel, real-time hand-held analyzer. With the software installed, it becomes a dedicated sound measurement platform. It takes the microphone signal through frequency weighting networks and anti-aliasing filters to an A/D converter. Then it processes the digital signal and sends outputs to various external digital devices.

One of these outputs is to the 192 × 128 mm LCD screen which is part of its user-interface to keep you constantly informed and in control.

Data Storage and Transfer to PC

Data can be stored in memory as well as transferred onto external credit-card sized PCMCIA memory cards for storage or transfer to a computer. Transfer of data to computer can, of course, also be done directly via the serial interface.

Post Measurement Software for a Computer

Once measured data are transferred to a computer, one of Brüel & Kjær's Windows®-based software packages can be used for post-processing and reporting (Noise Explorer™ Type 7815 for data management and reporting, Evaluator™ Type 7820 for Community Noise calculations or Protector™ Type 7825 for calculating Personal Noise Exposure). Alternatively, data can be exported to other standard software packages such as word-processors and spreadsheets.

Accessories

Brüel & Kjær also produces a range of accessories for use with each application software. These accessories can be those necessary for measurement or items which facilitate your measurements.

Support and After-sales Service

In addition, Brüel & Kjær provides a high level of support and after-sales service in the rare event of problems, and holds customer days and training for both novices and advanced users alike.

1.4 Experiment

After you have installed the software (see section 1.1) and mounted the microphone (see section 3.2) switch on the analyzer. This will lead to the display shown in Fig. 1.1. Press the $\overline{0\hookleftarrow}$ hard key to ensure that the symbol ▶ appears in the top left-hand corner of the display to signify that a measurement is in progress.

Press the ◀ hard key to minimise the list of menu items and expose the display fully. Press again to show menu.

If you want the full story, have a look at Chapter 5.

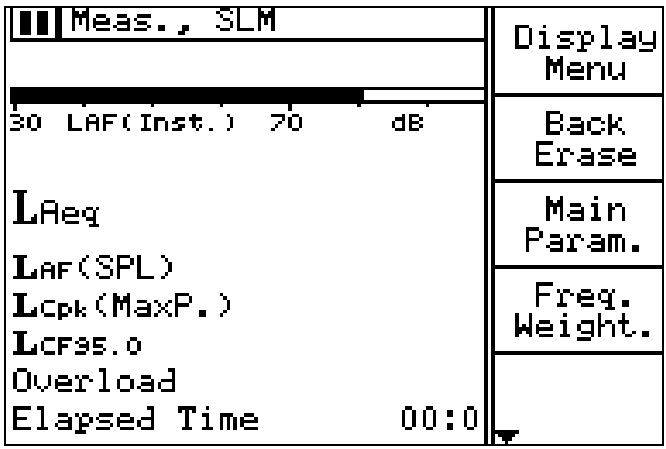


Fig. 1.1 The Measurement Display menu which appears after switching on the analyzer

1.5 How to Use this Manual

Beginners

Before you read the rest of this manual, read Brüel & Kjær's primer on Measuring Sound. This will give you a basic idea of acoustic measurements.

After that read the following.

Experienced Users of Acoustic Measurement Equipment

It is assumed that you are familiar with operating the platform (Brüel & Kjær's Modular Precision Sound Analyzer Type 2260).

The manual is built up such that you don't have to read all of it to be able to use it. It is built around the five most frequently used operations:

- Calibrating and setting-up (see Chapter 3)
- Measuring (see Chapter 4)

- Looking at Results (see Chapter 5)
- Storing and Recalling Data (see Chapter 6)
- Printing and exporting data (see Chapter 7)

Menu overviews can be found as fold-outs in Chapter 10 in this manual for software-dependent menus. Overviews of the platform-dependent menus can be found as fold outs in the platform's manual.

Conventions Used in this Manual

Hard Keys

Denoted by the relevant symbol (for example, ▲).

Soft Keys

Denoted by chevrons (<>) and courier type face (for example, <Undo>).

Path Denotations

Denoted by capitals and courier type face (for example, SET-UP\BZ7201\).

Parameter Text Appearing on the Display

Denoted by courier type face (for example, Format).

Sockets

Denoted by bold type face (for example, **Serial Interface**).

Chapter 2

The Software

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2.1 What the Software Does

The software converts Brüel & Kjær's Modular Precision Sound Analyzer Type 2260 into an advanced type 1 sound level meter and analyzer. With this software the analyzer is able to measure, analyse and record a multiplicity of parameters and information concurrently in a single operation – a technique called Multi-D™. Quite simply, this means you use much less of your time actually making measurements, thereby saving you money. Tables 2.1, 2.2, 2.3 and 2.4 show what the analyzer measures and records concurrently. Table 2.2 shows that in many cases some broadband parameters are measured with six different combinations of frequency and time weightings.

In addition there are facilities for:

- Automatically controlling measurements
- Pausing and continuing a measurement
- Storing and recalling data and set-ups
- Visually monitoring real-time data
- Examining recalled data
- Removing bad data from the measurements
- Control of and by external equipment
- Automatic control under one or more timer set-ups

Broadband (statistical) Parameters		
Parameter	Frequency Weighting	Time Weighting
Level- and cumulative-level distributions as well as five preselected L_N values. These are calculated from 401 accumulators each 0.2 dB wide.	Preselected during set-up for Broadband Stat. See Fig. 3.3. Can be: **A or C or L**	Preselected during set-up for Broadband Stat. See section 3.3.3. Can be: **Fast or Slow**

Table 2.1 Concurrently measured broadband statistical parameters

Broadband (discrete) Parameters		
Parameter	Frequency Weighting	Time Weighting
#Peaks	Preselected during set-up for Broadband Meas. See Fig. 3.3. Can be: **A and C or A and L**	**Peak**
Lpk (MaxP.)		
Lpk (Peak)		
L(Inst.)		**Fast and Slow and Impulse**
L(SPL)		
LT3		
LT5		
LTm3		
LTm5		
LMax		
LMin		
LIm		**Impulse**
Leq		**Linear**
LAEP,d	**A**	
LAE(SEL)		
Leq – LAeq	Taken from above parameters	Taken from above parameters
LAIm – LAeq		

Table 2.2 Concurrently measured broadband discrete parameters

Octave-band or 1/3-octave band (discrete and statistical) Parameters		
Parameter	Frequency Weighting	Time Weighting
L(INST.)	Preselected during set-up for Spectrum Meas. See Fig. 3.3. Can be: **A or C or L**	Preselected during set-up for Spectrum Meas. See section 3.3.3. Can be: **Fast or Slow**
L(SPL)		
LMax		
LMin		
Level- and cumulative-level distributions as well as five preselected L_N values. These are calculated from 81 accumulators each 1 dB wide (BZ 7206 only)		
Leq		**Linear**

Table 2.3 Concurrently measured Octave-band or $^1/_3$-octave band parameters, discrete as well as statistical

Additional (housekeeping) Data
Overload Underrange No. of Pauses Elapsed Time Start Date and Start Time Stop Date and Stop Time Measurement No. Event No. (BZ 7206 only) Event Sample No. (BZ 7206 only

Table 2.4 Concurrently recorded housekeeping data

See section 2.3 for a definition of the various measurement parameters and housekeeping data.

2.2 Operating with the Software

Whenever the analyzer is switched on, it goes into the Measurement mode signified by the display shown in Fig. 2.1. This mode provides all the facilities for visually monitoring real-time data as well as examining data recalled from storage.

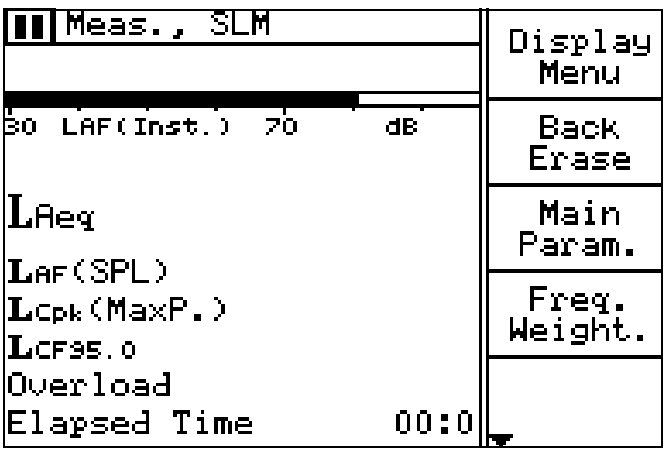

Fig. 2.1 The Display menu in the Measurement mode which follows after switching on the analyzer

2.2.1 Hard Keys and Soft Keys

You control the analyzer via two sets of keys referred to as either hard keys or soft keys. Hard keys are single function keys and are located on the body of the analyzer above the display (there are 19 of them). Soft keys are multi-function keys and are located on the right of the display (there are five of them). They are context-sensitive and their function is determined by whatever name appears in the display next to them.

See the first two chapters of the platform's instruction manual for full details on how to find your way around the analyzer's menus via its hard and soft keys.

2.2.2 The Four Operational Modes

The analyzer operates in one of four modes each initiated by its own hard key. Listed here with their respective hard-key icons, these are:

- System, see platform's instruction manual
- Set-up, see Chapter 3
- Measure, see Chapter 4
- Calibrate, see section 4.4

2.2.3 Handling Data

Post-measurement data can be handled in two different ways, that is, stored (and subsequently recalled) or copied to an external device.

Stored and Recalled

All measurement and set-up data can be stored in files from where they can be recalled at any time. You decide whether to store internally (on the disk) or externally on a PCMCIA memory card. Chapter 6 has all the details.

Copied to an External Device

Data can also be sent out to an external device via the analyzer's serial interface. The external device can be either a printer or a PC. Chapter 7 has all the details.

2.2.4 Statistics

There are three types of statistical data which you can examine during or after a measurement. These are cumulative distribution, level distribution and user-defined percentile levels.

Cumulative Distribution

This is displayed as a curve from which, using the cursor soft keys, you can read-off any percentile level. See Chapter 5 for full details.

Level Distribution

This is displayed as a curve from which, using the cursor soft keys, you can read-off what percentage of the time the measured parameter level spent within any class interval. The class interval is user-definable. See Chapter 5 for full details.

User-defined Percentile Levels

Five user-defined percentile levels included with the comprehensive range of discrete measurement parameters, see section 2.3.2.

2.3 What is Measured and Recorded

2.3.1 Introduction

In this section, instantaneous values for parameters marked:

(‡) are replaced by a new one every second.

(‡‡) are replaced by a new one every three seconds.

(‡‡‡) are replaced by a new one every five seconds.

All others are currently valid for the time elapsed since the measurement start.

2.3.2 Discrete Parameters During a Measurement

The following is a list of broadband discrete parameters measured by the analyzer. The X and Y refer respectively to frequency weightings (A, C or L) and time weightings (S, F or I).

- Elapsed time:
  Time elapsed since start of measurement.

- #X Peaks:
  Number of times peak levels (separated by 1 s or more) exceed a user-defined value during a measurement.
- L_{Xpk} (MaxP.):
  Maximum Peak value detected during the measurement.
- L_{Xpk} (Peak)*: (‡)
  Peak value.
- L_{XY} (SPL)*: (‡)
  Maximum value of RMS level in 1-second interval as defined by IEC 60651.
- L_{XY} (Inst.)*: (‡)
  Last sampled instantaneous value of RMS level as defined by IEC 60651 and JIS C 1505.
- L_{XYT3}: (‡‡)
  3-second Taktmaximal value as defined by TA Lärm and VDI 2058.
- L_{XYT5}: (‡‡‡)
  5-second Taktmaximal value as defined by TA Lärm and VDI 2058.
- L_{AE} (ASEL):
  A-weighted sound exposure level for the duration of the measurement as defined by IEC 60804.
- L_{Xeq}:
  Equivalent continuous level for the duration of the measurement as defined by IEC 60804.
- L_{XIm}:
  Equivalent continuous Impulse level for the duration of the measurement as defined by IEC 60804, Appendix B.
- $L_{Xeq} - L_{Aeq}$:
  Can be used as a measure of low-frequency spectral content if X = C.
- $L_{AIm} - L_{Aeq}$:
  Can be used as a measure of impulsive content.

* Replaced 15 times per second when displayed graphically

- L_{XYTm3}:
  Average 3-second Taktmaximal value for the duration of the measurement as defined by TA Lärm and VDI 2058.
- L_{XYTm5}:
  Average 5-second Taktmaximal value for the duration of the measurement as defined by TA Lärm and VDI 2058.
- $L_{XY\ Max}$:
  Max. L_{XY} value detected within the elapsed time.
- L_{XYN1}:
  User-defined percentile level where the value of L_{XYN1} is exceeded for N1% of the elapsed time.
- L_{XYN2}:
  User-defined percentile level where the value of L_{XYN2} is exceeded for N2% of the elapsed time.
- L_{XYN3}:
  User-defined percentile level where the value of L_{XYN3} is exceeded for N3% of the elapsed time.
- L_{XYN4}:
  User-defined percentile level where the value of L_{XYN4} is exceeded for N4% of the elapsed time.
- L_{XYN5}:
  User-defined percentile level where the value of L_{XYN5} is exceeded for N5% of the elapsed time.
- L_{XY} Min:
  Min. L_{XY} value detected within the elapsed time.
- $L_{AEP,d}$:
  Daily A-weighted Personal Noise Exposure Level as defined by EEC 88/186 (see Fig. 2.2). This is the 8 hour noise dose of a constant A-weighted sound level which lasts for a period of time T_e but is measured only over a time T.

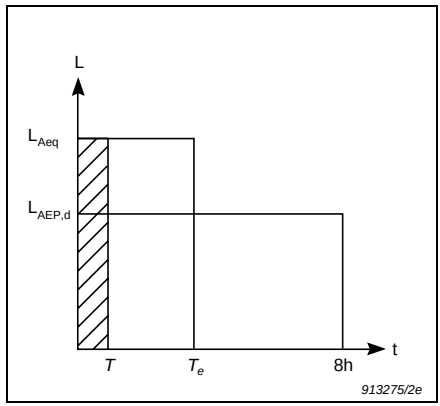

Fig. 2.2 *$L_{AEP,d}$ compared to L_{Aeq}. The shaded area represents the measurement time*

2.3.3 Discrete Parameters with Spectrum band data

The following discrete parameters are available also with the measurement of octave-band or $^1/_3$-octave band levels (see section 2.3.2 for definitions):

- L_{XY} (SPL) (‡)
- L_{XY} (Inst.) (‡)
- L_{Xeq}
- L_{XY} Max
- L_{XYN1} (BZ 7206 only)
- L_{XYN2} (BZ 7206 only)
- L_{XYN3} (BZ 7206 only)
- L_{XYN4} (BZ 7206 only)
- L_{XYN5} (BZ 7206 only)
- L_{XY} Min

2.3.4 Housekeeping Data

The following housekeeping data accompany all measurements:

- Overload %
  Calculated as a percentage of the current elapsed time. Occurs whenever the upper limit of either the analogue or digital circuits is exceeded.
- Underrange %
  Calculated as a percentage of the current elapsed time. Occurs whenever the sound level being measured drops below the lower limit of the linear operating range.
- No. of pauses
  Counted during the current elapsed time, that is, from the measurement start.
- Measurement no.

  1. The current number of times a given measurement sequence (see section 3.5) has run automatically since the $\overline{0\leftarrow}$ hard key was last pressed (BZ 7206 only).

  2. The current sample number in a logging background measurement.
- Event No. (BZ 7206 only)
  Used in event logging, where events are numbered consecutively, starting at the beginning of the logging period.
- Event Sample No. (BZ 7206 only)
  Used in event logging, where samples within each event are numbered consecutively.
- Start Date
  Referred to the measurement start.
- Start Time
  Referred to the measurement start.
- Stop Date
  Referred to the measurement end.
- Stop Time
  Referred to the measurement end.

Chapter 3

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3.1 Introduction

This chapter explains how to prepare the analyzer for making measurements, that is, how to:

- Mount the microphone and the input stage
- Connect a microphone extension cable
- Set up measurement parameters
- Set up measurement control parameters
- Set up the sound level meter display
- Set up the analogue inputs and outputs

3.2 Mounting the Microphone

Before mounting the microphone, note the following precautions:

- When screwing on the microphone, input stage, protection grid and extension cables, **do it gently** to avoid damaging the threads.
- Keep dust and foreign matter off the microphone diaphragm. Do not touch the diaphragm with anything – it is very delicate.

Mounting the Microphone and Input Stage

The microphone normally used with this software is the Prepolarized Free-field 1/2″ Microphone Type 4189 and requires no external polarization voltage. Ensure that the polarization voltage of the analyzer is set to 0 V (see section 3.4). The Input Stage ZC 0026 is required for use with the platform.

1. Gently screw the microphone onto the Input Stage ZC 0026.

Fig.3.1 Mounting the input stage and microphone onto the analyzer

2. Insert the input stage into the input stage socket at the top of the analyzer and secure it by turning the threaded retaining ring (see Fig. 3.1).

Connecting a Microphone Extension Cable

There are two optionally available extension cables which are recommended for use with the analyzer. These are:

- AO 0441 3 m long
- AO 0442 10 m long

To Connect:

1. Gently screw the microphone onto the Input Stage ZC 0026.

2. Insert the input stage into the female plug of the extension cable and push gently until it snaps into position.

3. Insert the male plug of the extension cable into the input stage socket of the analyzer and push gently until it snaps into position (see Fig. 3.2).

Fig. 3.2 Connecting a microphone extension cable to the sound level meter

Note: Connecting a recommended microphone extension cable has no effect on the sound level meter's calibration. Therefore, you do not have to re-calibrate after connecting one of the recommended microphone extension cables.

3.3 Setting Up the Measurement Parameters

3.3.1 Introduction

This section will explain how to set up measurement parameters such as range, time weighting and frequency weighting. Once they are set up, they are not normally changed until the measurements are completed.

See section 3.4 for setting up the microphone polarization voltage and the valid sound incidence correction.

See section 3.5 for setting up the analyzer to control measurements according to specified requirements.

3.3.2 Selecting Measurement Parameters

1. Start by pressing the set-up hard key symbolised by ⊣⊢ and then get the Set-up Measurement Parameters menu (Fig.3.3) on display and proceed as follows:

2. Use the ◄ ► ▲ ▼ hard keys to step through the various fields of selectable parameters until the one you want to change is highlighted.

3. Then with the < ▲ > and < ▼ > soft keys step through the available settings or values of that parameter until the one you need is displayed.

   This will also cause the <Save> and <Undo> soft keys to appear. The range of available settings for each measurement parameter is given in section 3.3.3.

4. Press the <Save> soft key to confirm your choice, this will also cause the <Save> and <Undo> soft keys to disappear.

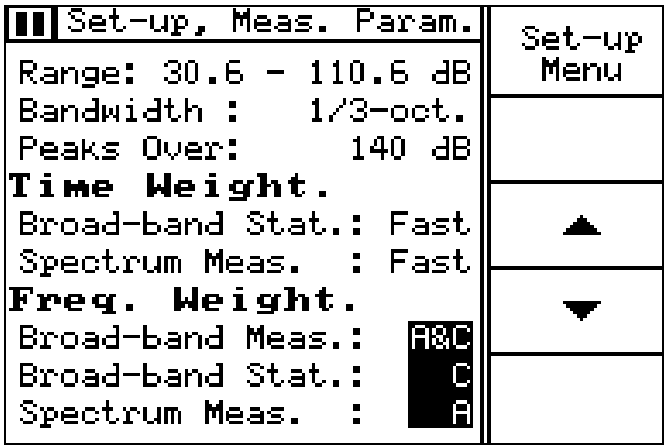

Fig. 3.3 The Set-up Measurement Parameters menu for selecting settings and values for the measurement parameters

If you wish to undo any one of these, press the <Undo> soft key and all settings/values will revert to what they were the last time the <Save> soft key was pressed.

5. Repeat steps 2, 3 and 4 until you are satisfied with the setting or value of each parameter.

3.3.3 Range of Settings for Measurement Parameters

Fig. 3.3 itemises the measurement parameters whose settings or values can be changed as described in section 3.3.2. The following describes what they are and how they affect measurements.

Note: Changing any of these set-up measurement parameters during a measurement will automatically reset and restart the analyzer. This means that data so far measured will be deleted and overwritten by new data measured with the changed parameter in the set-up.

You will be warned by a pop-up display which requires either confirmation (press the <OK> soft key) or cancellation (press the <Cancel> soft key) of the intended parameter change. There are two exceptions when no warning is given and parameter changes take place immediately, these are:

- When the data so far measured have been stored (see section 6.2).
- When the measurements have been running for less than one minute.

Range:

The analyzer's 80 dB linear operating range can be placed between any one of six regular, overlapping positions. Table 3.1 shows settings when calibrated (see section 4.4.2) for a Type 4189 microphone with a nominal sensitivity of – 26 dB re 1 V/Pa. The settings in Table 3.1 are for RMS sinusoidal signals, therefore the maximum peak level handling is 3 dB above the selected range setting.

Range Settings
50 dB to 130 dB
40 dB to 120 dB
30 dB to 110 dB
20 dB to 100 dB
10 dB to 90 dB
0 dB to 80 dB

Table 3.1 Range settings when used with a nominal Type 4189 microphone

You can also step change the range position using the dB hard key.

Spectrum Bandw.:

Fixes the bandwidth for spectral analyses, and can be set to either:

Setting	Frequency Range
1/1-oct.	16 Hz to 16 kHz
1/1-oct.-LF	8 Hz to 16 kHz
1/3-oct.	12.5 Hz to 20 kHz
1/3-oct.-LF	6.3 Hz to 20 kHz

Note: Use the two "LF" settings if you need to analyse below 12.5 Hz. However, be aware that these settings are more sensitive to very low frequency noise such as wind noise. See specifications for details on the low frequency response.

Peaks Over:

Fixes a level for counting the number of times this level is exceeded by peak values (separated by 1 s or more) detected during a measurement. The default level is set to 140 dB.

This level must lie within the selected linear operating range. If necessary, fit an Attenuator ZF 0023 between the microphone and the input stage. This has the effect of reducing the sensitivity of the microphone by 20 dB.

Time Weight.:

`Broadband Stat.`
Fixes the time weighting (`Fast` or `Slow`) for measuring statistical distributions of broadband noise levels.

Applies to the level and cumulative distributions of broadband levels as described in sections 5.5 and 5.6, the discrete parameters L_{XYN1} to L_{XYN5} which can appear in the Sound Level Meter display (see section 5.4) as well as the broadband columns discussed in section 5.10. See also Tables 2.1, 2.2, 2.3 and 2.4.

`Spectrum Measure.`
Fixes the time weighting (`Fast` or `Slow`) for measuring the

octave-band or $^1/_3$-octave band levels and their statistical quantities based on level- and cumulative distributions.

Applies to the level and cumulative distributions of all octave-band or $^1/_3$-octave band levels as described in sections 5.5 and 5.6 as well as the octave-band or $^1/_3$-octave band levels discussed in section 5.10 (BZ 7206 only).

Freq. Weight.:

There are ten available fixed groups of frequency weightings for the three types of measurements itemised under this parameter, and listed below:

`Broadband Meas.`

`Broadband Stat.`

`Spectrum Meas.`(and statistics)

The available groups are shown in Table 3.2.

Measurements	Available Groups of Frequency Weightings									
Broadband Measurements	A and C						A and L			
Broadband Statistics	A			C			A		L	
Spectrum Measurements	A	C	L	A	C	L	A	L	A	L

Table 3.2 The ten available groups of frequency weightings for the types of measurements listed in the column on the left. Tables 2.1, 2.2 and 2.3 show which parameters are affected by these settings

Thus, all A-weighted data will have been channelled through the A-weighting network while all other parallel data will have been channelled either through a C or L (linear) weighting network. This allows the analyzer to measure:

$$L_{Ceq} - L_{Aeq}$$

which is a recognised parameter for determining the low-frequency content in a measured signal.

3.4 Setting Up the Input (Microphone or AC)

3.4.1 Introduction

The analyzer can be set up to analyze a signal from one of the following:

- The analyzer's microphone preamplifier, in which case you must also select the correct polarization voltage for the microphone and the valid sound incidence correction.

- Via the analyzer's **AC Input/Output** sockets (shown as 25 and 26 on inside rear cover), for example originating from a tape recorder.

If you choose the signal from the microphone preamplifier, both **AC Input/Output** sockets automatically become outputs for the buffered, unweighted signal from the microphone preamplifier. In which case these outputs can be used for making tape recordings of measured signals.

Note: As outputs, these two **AC Input/Output** sockets are functionally identical, use either one or the other. However, as inputs, they must **both** be connected to the signal source.

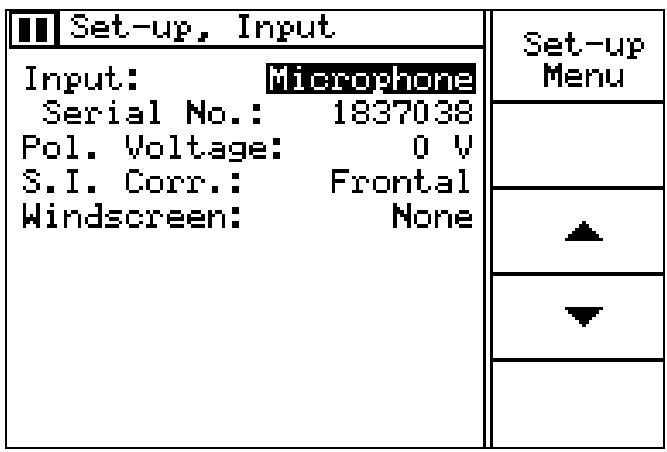

Fig.3.4 The Set-up Input menu showing that this analyzer has been initially calibrated with a particular microphone

3.4.2 Selecting Input Parameters

1. Start by pressing the set-up hard key symbolised by ⊣⊢ and get the Set-up Input menu (Fig. 3.4) on display.

2. Use the ◄ ► ▲ ▼ hard keys to step through the various fields of the selectable parameters until the one you want to change is highlighted.

3. Then with the < ▲ > and < ▼ > soft keys step through the available settings or values of that parameter until the one you need is displayed.

   This will also cause the <Save> and <Undo> soft keys to appear. The range of available settings for each measurement control parameter is given in section 3.4.3.

4. Press the <Save> soft key to confirm your choice, this will also cause the <Save> and <Undo> soft keys to disappear.

   If you wish to undo any one of these, press the <Undo> soft key and all settings/values will revert to what they were the last time the <Save> soft key was pressed.

5. Repeat steps 2, 3 and 4 until you are satisfied with the setting or value of each parameter.

3.4.3 Range of Settings for Input Parameters

Fig. 3.4 itemises the input parameters whose settings or values can be changed as described in section 3.4.2. The following describes what they are and how they affect measurements.

Note: As with measurement parameters, the same conditions as those described in section 3.3.3 apply if you change any of these input parameters during a measurement.

Input:

To analyse either the microphone signal or a signal via the **AC Input/Output** sockets, the settings are respectively:

- Microphone (specified via its serial no. or unspecified)
- AC

If an initial calibration has been done by Brüel & Kjær (applies to all type 2260's from serial number 1875363 and above)

with the specified microphone (usually the one supplied with the analyzer), both microphone serial number and calibration details are registered within the analyzer. When selecting a microphone input, you can specify either the registered microphone (its `Serial No.` will appear) or an unspecified microphone (`Serial No.: Unspec.` will appear).

If you select the registered microphone, the following applies:

- Microphone data will be documented with all measurement data. The print out of a measurement set-up will include the microphone's serial number as well as details of its initial calibration.
- If a calibration detects that the microphone sensitivity has deviated by more than ± 1.5 dB from the initial calibration, the calibration procedure will automatically be cancelled. Contact your local Brüel & Kjær representative.

If you select an unspecified microphone, there will be no calibration documentation. However, a large range of sensitivities is permitted.

If no initial calibration has been done, the software will select the case for an unspecified microphone and a blank line will appear in place of the serial number in Fig. 3.4.

If you select `Input: AC` then the `Type` can be selected in the second line:

- `Normal` for interpreting the input as sound pressure levels in dB relative to 20 μPa.
- `Hand Arm Vib.` for use with the 3-channel Human Vibration Front-end WB 3461 – special readings of a_{hw} in m/s^2 in the Spectrum display.
- `Whole Body Vib.` for use with the 3-channel Human Vibration Front-end WB 3461 – special readings of a_{wx}, a_{wy}, a_{wz} and a_v in m/s^2 in the Spectrum display.

For Hand Arm Vibration or Whole Body Vibration refer to Technical Documentation BB 1230 for the 3-channel Human Vibration Front-end WB 3461 for connecting the front-end to 2260, for calibrating the system, for measuring and for reading the results.

Pol. Voltage:

Fixes the polarization voltage required for the microphone, can be set to:

- `0 V` for a prepolarized microphone, for example Type 4189 which is normally used with this software.

  OR

- `200 V` for any other Brüel & Kjær $^1/_2$″ microphone requiring an external polarization of 200 V.

Note: Allow at least 30 s after changing the polarization voltage before making any measurements.

If you inadvertently select a polarization of 200 V for a Type 4189 microphone, its sensitivity will fall significantly to make calibration (see section 4.4) impossible. No damage will be done to the microphone, just correct the fault by selecting a polarization of 0 V.

S. I. Corr.:

Fixes the Sound Incidence Correction, can be set to either:

- `Frontal`
- `Random`

Generally, ISO requires `Frontal` and ANSI requires `Random`. Check your local standards for the setting you require.

Windscreen Correction

For outdoor measurements, it is often necessary to mount a windscreen on the microphone to damp the influence of the wind. This has, however, a small impact on the overall frequency response of the analyzer. To compensate for this, use the windscreen correction setting in the `Set-up`, `Input`.

- Choose `None` if the microphone is without windscreen.
- Choose `Prot.Cvr.` if you have mounted the protective cover supplied with the analyzer (UA 1236).
- Choose `65mm` if you have mounted a 65 mm diameter windscreen UA 0459 (UA 0469 is a pack of 6 windscreens).

- Choose `90mm` if you have mounted a 90 mm diameter windscreen UA 0237 (UA 0254 is a pack of 6 windscreens).

3.5 Controlling Measurements

3.5.1 Introduction

This section will explain how to set up parameters which activate, control, stop and store measurements. Once they are set up, they are not normally changed until the measurements are completed.

See section 3.3 for setting up the measurement parameters according to specified requirements.

3.5.2 Selecting Controlling Parameters

Start by pressing the set-up hard key symbolised by ⊣⊢ and then get the Set-up Measurement Control menu (Fig. 3.5) on display.

Note: If the setting for the item `Func.:` in Fig. 3.5 is set to `Manual`, the remaining items will disappear from the display and the analyzer will be under manual control. See section 3.5.3.

3.5.3 Settings for Measurement Control Parameters

Fig. 3.5 itemises the measurement control parameters whose settings or values can be changed as described in section 3.3.2. The following, together with the block diagram shown in Fig. 3.6 and Fig. 3.7, describe what the parameters are and how they affect measurements.

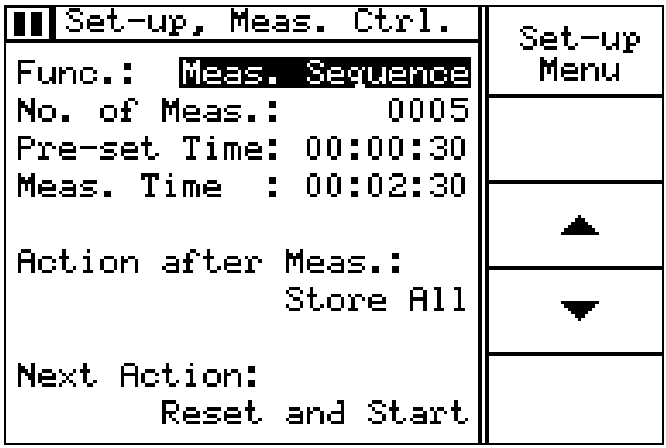

Fig.3.5 The Set-up menu for selecting settings and values for the measurement control parameters

Function (Manual or Automatic Control):

The settings for this parameter are `Manual`, `Meas. Sequence`, `Logging` or `Event Logging`.

- When set to `Manual` the analyzer comes under manual control via its hard and soft keys. All remaining items on the display disappear.
- When set to anything other than `Manual` the analyzer comes under automatic control.

3.5.4 Manual Control (Function: Manual)

To start a measurement, or reset it and start again, press the 0 hard key. The measurement will proceed perpetually. The course a single measurement takes under manual control depends on what hard or soft keys are pressed between the start and end of a measurement.

If you press the ⏯ hard key while a measurement is running, the measurement will pause and the elapsed time coun-

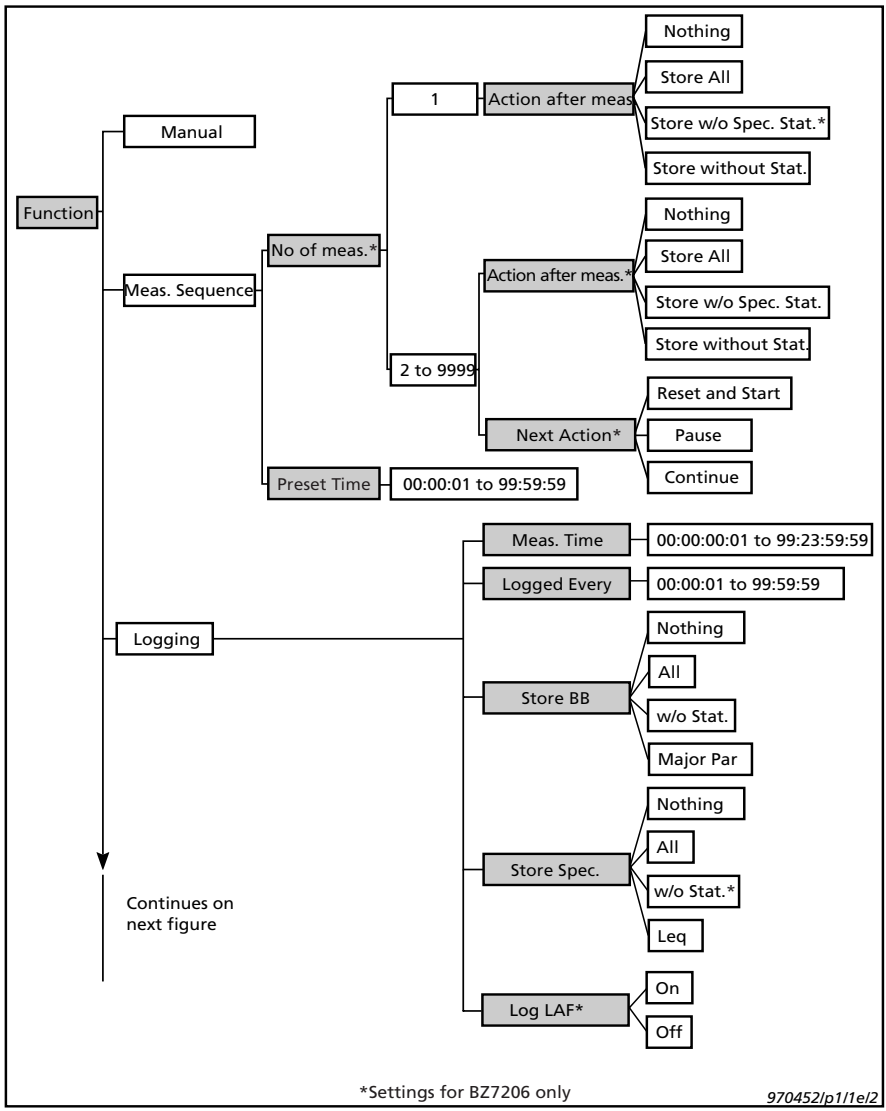

Fig. 3.6 Block diagram of measurement control parameters (shaded) and their settings (unshaded). Diagram continues in Fig. 3.7. Note the "Meas. Sequence" setting is named as "Automatic" in BZ 7210 and BZ 7219

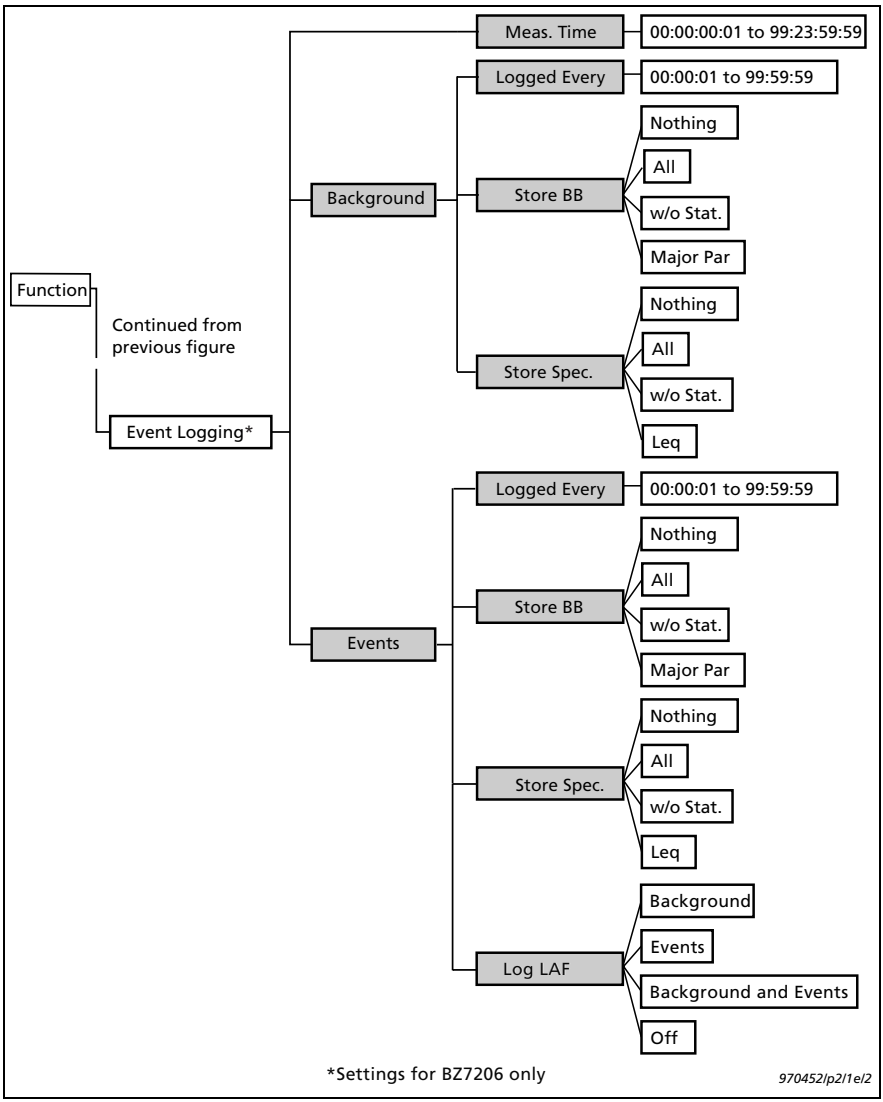

Fig. 3.7 Block diagram showing measurement control parameters (shaded) and their possible settings (unshaded). Diagram is continued from Fig. 3.6

ter will stop. If you press it again, the measurement will continue and the elapsed time counter will start again.

- If you press the $\overline{0\leftarrow}$ hard key while a measurement is running (the conditions for doing this are the same as for changing a set-up parameter, see section 3.5.3), all data will be lost, the measurement will start again and the elapsed time counter start again from zero.

3.5.5 Automatic Control (Function: Automatic) (BZ 7210 and BZ 7219 only)

A measurement is initiated manually by pressing the $\overline{0\leftarrow}$ hard key. Once initiated, the duration of the measurement is controlled by the time specified under `Pre-set Time`. When the duration (Elapsed Time) equals Pre-set Time, the measurement will stop automatically.

Preset Time:

Fixes the duration (in hours, minutes and seconds) of a measurement from start to automatic stop. Any pauses made during measurement via the $\frac{\text{II}}{\blacktriangleright}$ hard key are not counted in the pre-set time. The range of possible entries is from `00:00:01` to `99:59:59`.

Action after Meas.:

Can be set to one of the following:

- `Store All`:
  Each time the measurement has run its course, all measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `Store without Stat.`:
  As with `Store All` but exclude all statistical data.
- `Nothing`:
  No data storage takes place.

3.5.6 Automatic Control (Function: Meas. Sequence) (BZ 7206 only)

A sequence of measurements is initiated either manually by pressing the 0↩ hard key or automatically via a preset timer (see section 4.7). Once initiated, the sequence of measurements is controlled via the settings of the remaining items displayed in Fig. 3.5.

Press the ▶/‖ hard key either to pause the analyzer or to regain manual control when started by a preset timer (see section 4.7). Press the 0↩ hard key to reset and start the sequence again.

No. of Meas.:

Can be set to any integer number between `1` and `9999`. This setting fixes the number of times the measurement is run automatically.

Preset Time:

Fixes the duration (in hours, minutes and seconds) of a measurement from start to automatic stop. Any pauses made during the measurement via the ▶/‖ hard key are not counted in the preset time. The range of possible entries is from `00:00:01` to `99:59:59`.

Meas. Time:

This is the time a measurement takes to run its course the number of times specified under `No. of Meas.:` It is automatically calculated by the analyzer and is equal to the product:

`No. of Meas.` × `Preset Time`

Next Action:

After the end of first measurement run, this decides how all subsequent measurement runs will start.

Can be set to `Reset and Start`, `Pause` or `Continue`.

- `Reset and Start`:
  After each measurement run, the next measurement is automatically initiated immediately via “Reset and Start”. In this way a series of measurements each with a duration of the “Preset Time” is performed. See Fig. 3.8 upper diagram. When storage takes place, each consecutive measurement is stored under its own consecutive “measurement number” within the storage file. For example see Fig. 3.32 which shows file number 26 and measurement number 3 as `0026.S3C/0003`.

- `Pause`:
  After each measurement run, the measurement goes into pause. The next measurement is initiated when the ⏯ hard key is pressed (see Fig. 3.8 middle diagram). In this way a series of measurements, each initiated by the ⏯ hard key (except the first measurement) and with a duration of the “Preset Time,” is performed. No data are stored during the pauses between measurements.

  When data are stored, each measurement is stored under its own consecutive “measurement number” within the storage file. For example see Fig. 3.32, which shows file number 26 and measurement number 3 as `0026.S3C/0003`.

- `Continue`: (useful autosave function)
  After each measurement run, measurement continuation is immediate and automatic via “Continue”. In this way, the current result is always based on the latest multiple of the “Preset Time”. This set-up ensures that in the event of a power loss, the worst that can happen is that only the data for the current (uncompleted) multiple of the “Preset Time” will be lost. See Fig. 3.8 lower diagram.

In all cases the analyzer will go into pause when the measurement has run its course the number of times specified under `No. of Meas.:`.

Note: No data are lost if `Store` is combined with either `Reset and Start` or `Continue`.

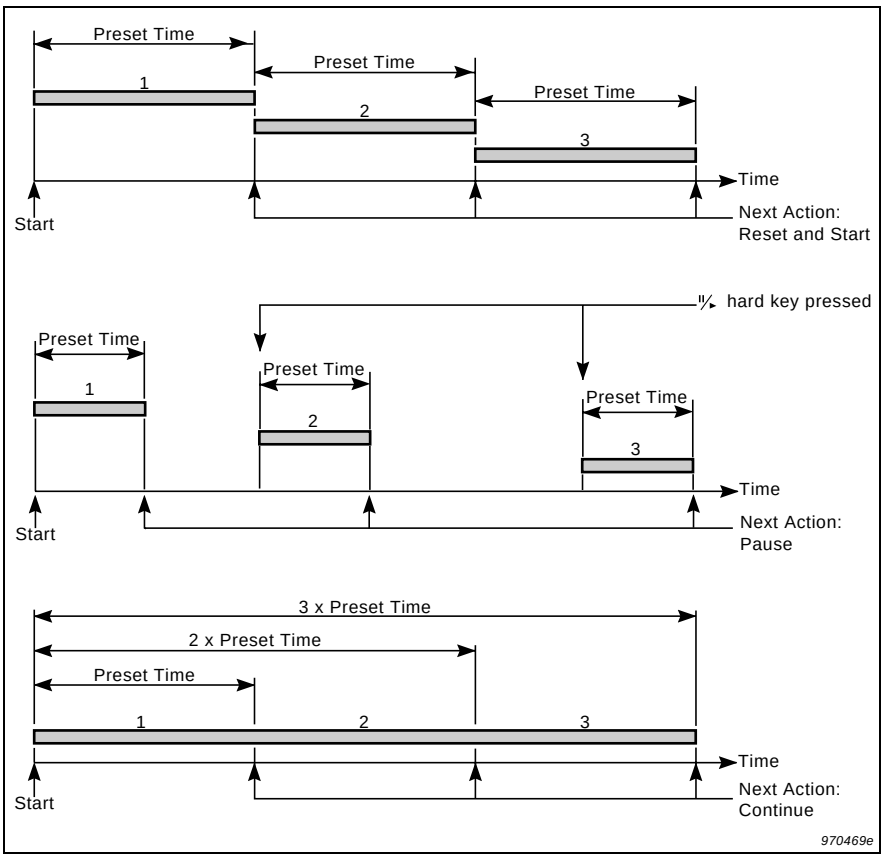

Fig. 3.8 Showing the difference between the three possible outcomes for 'Next Action' in the set-up for Measurement Control Parameters

3.5.7 Automatic Control (Function: Logging)

The Logging function is an automatic control of 2260 Investigator/Observer designed to allow unattended measurements. Basically the Logging function is the same as Meas. Sequence (see section 3.5.6) with the following differences:

- Measurement time is input directly in terms of days, hours, minutes and seconds (maximum 100 days).

- The Logging rate need not be an integer factor of Measurement time.
- Logging is synchronised with the internal clock in 2260 Investigator/Observer such that logging samples begin and end on “convenient” hours/minutes/seconds where possible (i.e., when you specify a logging interval that divides evenly into the internal clock’s hours/minutes/seconds reading).
- Automatic CIC checks can be integrated into Logging.

Logging is initiated either manually by pressing the 0↩ hard key or automatically via a preset timer (see section 4.7). Once initiated, the sequence of measurements is controlled via the settings of the remaining items displayed in Fig. 3.9.

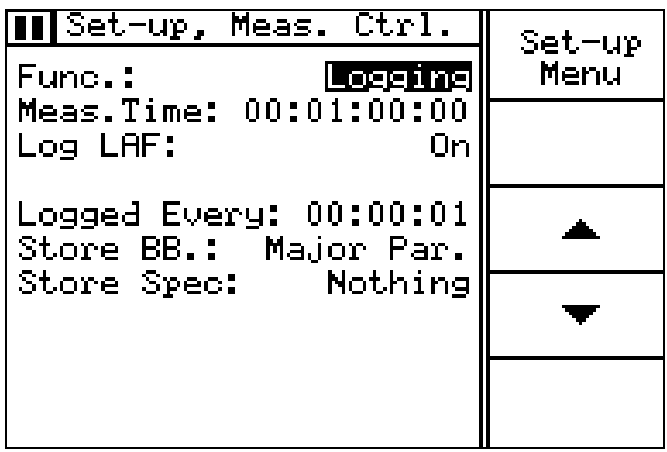

Fig. 3.9 The Logging screen (Log L_{AF} settings for BZ 7206 only)

Press the ⏯ hard key either to pause the analyzer or to regain manual control when started by a preset timer (see section 4.7). Press the 0↩ hard key to reset and start the sequence again.

Meas. Time:

Fixes the duration (in days, hours, minutes and seconds) of a measurement from start to automatic stop. Any pauses made during the measurement via the ⏯ hard key are counted in the measurement time. The range of possible entries is from `00:00:00:01` to `99:23:59:59`.

Log L_{AF} (BZ 7206 only):

L_{AF} (Inst.) is logged every 100 ms, if "Log L_{AF}" is set to `On` and "Logged Every" is set to `00:00:01`. The logged L_{AF}(Inst.) values are stored together with the other logged data. The Profile (see fig. 5.10) displays the L_{AF}(Inst.) values while measuring .

Note: The logged L_{AF}(Inst.) values cannot be displayed by the 2260. The data has to be transferred to PC software Noise Explorer Type 7815, Evaluator Type 7820 or Protector Type 7825 for display.

Logged Every:

Fixes the duration (in hours, minutes and seconds) of logging samples. Any pauses made during the measurement via the ⏯ hard key end the current logging period and store the sample (if specified). A subsequent continue via the ⏯ hard key resumes the logging with a new logging period. The pause between the two samples is included in the measurement time. The range of possible entries is from `00:00:01` to `99:59:59`.

For the following logging intervals, logging is synchronised with the internal clock:

- 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 seconds/minutes
- 1, 2, 3, 4, 6, 8, 12 or 24 hours

The start of the first logging period coincides with the start of the measurement. At the specified hour/minute/second, the second logging period starts. Subsequent periods will keep in "convenient" synchronisation with the internal clock. See Fig. 3.12 for more details.

Store BB. (after each sample).:

Can be set to one of the following:

- `All`:
  Each time the sample has run its course, all broadband measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.`:
  As with `All`, but excludes all broadband statistical data.
- `Major Par.`:
  (L_{Aeq}, $L_{C/Lpk(MaxP)}$, L_{AFMax}, L_{AFMin}, $L_{C/Leq}$, L_{AIm}).
  Frequency weighting C/L depends on set-up (see section 3.3.3).
- `Nothing`:
  No data storage takes place.

Store Spec. (after each sample).:

Can be set to one of the following:

- `All`:
  Each time the sample has run its course, all spectrum measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.` (BZ 7206 only):
  As with `All`, but excludes only statistical data on $^1/_1$-octave bands or $^1/_3$-octave bands.
- L_{eq}:
  Stores only L_{eq} spectra. Frequency weighting depends on set-up (see section 3.3.3).
- `Nothing`:
  No data storage takes place.

3.5.8 Automatic Control (Function: Event Logging) (BZ 7206 only)

The event logging function allows 2260 Investigator to measure background sound levels using one set of parameters (similar to normal logging function) and, when triggered by

an event, use another set for the duration of the event (event logging).

For example, you might set an event trigger to occur when the $L_{AF(Inst)}$ exceeds 70 dBA. As long as the level is below this value, 1 minute logging might be in operation. As soon as the level goes above this (for example a compressor starts), the sampling rate is reduced to 1 second intervals (event logging) and continues until the level drops below the threshold value. In this way you have a higher resolution account of the noise levels during the event.

During event recordings, the running symbol [▶] in the upper left corner of the screen is replaced by the recording symbol [●].

Events may be detected automatically using criteria you select, or initiated by remote command through the RS–232 interface. Event measurement may also be initiated using an external trigger pulse or by activating a softkey. See section 3.5.9.

Logging is initiated either manually by pressing the $\overline{0\leftarrow}$ hard key or automatically via a preset timer (see section 4.7). Once initiated, the sequence of measurements is controlled via the settings of the remaining items displayed in Fig. 3.10.

Press the $\frac{\prime\prime}{\prime}$ hard key either to pause the analyzer or to regain manual control when started by a preset timer (see section 4.7). Press the $\overline{0\leftarrow}$ hard key to reset and start the logging again.

Meas. Time:

Fixes the duration (in days, hours, minutes and seconds) of a measurement from start to automatic stop. Any pauses made during the measurement via the $\frac{\prime\prime}{\prime}$ hard key are counted in the measurement time. The range of possible entries is from `00:00:00:01` to `99:23:59:59`.

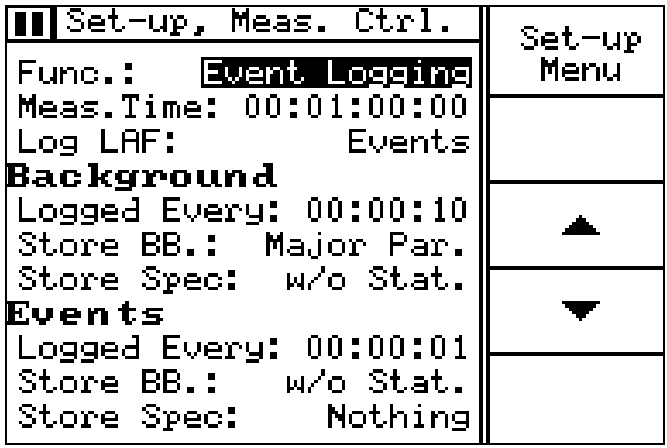

Fig.3.10 The Event Logging screen (BZ 7206 only)

Log L_{AF}:

L_{AF}(Inst.) is logged every 100 ms during background measurements, if "Log L_{AF}" is set to `Background` and "Logged Every" for Background is set to `00:00:01`.

L_{AF}(Inst.) is logged every 100 ms during event measurements, if "Log L_{AF}" is set to `Events` and "Logged Every" for Events is set to `00:00:01`.

L_{AF}(Inst.) is logged every 100 ms during both background and event measurements, if "Log L_{AF}" is set to `Bckgr+Events` and "Logged Every" for both Background and Events are set to `00:00:01`.

The logged L_{AF}(Inst.) values are stored together with the other logged data. The profile (see Fig. 5.10) displays the L_{AF}(Inst.) values while measuring.

Note: The stored L_{AF}(Inst.) values cannot be displayed by 2260. The data has to be transferred to the PC software Noise Explorer Type 7815, Evaluator Type 7820 or Protector Type 7825 for display.

Background Measurements

The following three parameters define the broadband and spectral data to be measured for the background measurement.

Logged Every:

Fixes the duration (in hours, minutes and seconds) of logging samples. Any pauses made during the measurement via the ⏯ hard key end the current logging period and store the sample (if specified). A subsequent continue via the ⏯ hard key resumes the logging with a new logging period. The pause between the two samples is included in the measurement time. The range of possible entries is from `00:00:01` to `99:59:59`.

For the following logging intervals, logging is synchronised with the internal clock:

- 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 seconds/minutes
- 1, 2, 3, 4, 6, 8, 12 or 24 hours

The start of the first logging period coincides with the start of the measurement. At the specified hour/minute/second, the second logging period starts. Subsequent periods will keep in "convenient" synchronisation with the internal clock. See Fig. 3.12 for more details.

Store BB. (after each sample).:

Can be set to one of the following:

- `All`:
  Each time the sample has run its course, all broadband measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.`:
  As with `All`, but excludes all broadband statistical data.
- `Major Par.`:
  (L_{Aeq}, $L_{C/Lpk(MaxP)}$, L_{AFMAx}, L_{AFMin}, $L_{C/Leq}$, L_{AIm}).
  Frequency weighting C/L depends on set-up (see section 3.3.3).

- `Nothing`:
  No data storage takes place.

Store Spec. (after each sample).:

Can be set to one of the following:

- `All`:
  Each time the sample has run its course, all spectrum measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.`:
  As with `All`, but excludes only statistical data on $^1/_1$-octave bands or $^1/_3$-octave bands.
- L_{eq}:
  Stores only L_{eq} spectra. Frequency weighting depends on set-up (see section 3.3.3).
- `Nothing`:
  No data storage takes place.

Event Measurements

The following three parameters define the broadband and spectral data to be measured for the event measurement.

Note: The parameter settings are a duplicate of the background measurement settings.

Logged Every:

Fixes the duration (in hours, minutes and seconds) of logging samples. Any pauses made during the measurement via the ⏯ hard key end the current logging period and store the sample (if specified). A subsequent continue via the ⏯ hard key resumes the logging with a new logging period. The pause between the two samples is included in the measurement time. The range of possible entries is from `00:00:01` to `99:59:59`.

For the following logging intervals, logging is synchronised with the internal clock:

- 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 seconds/minutes
- 1, 2, 3, 4, 6, 8, 12 or 24 hours

The start of the first logging period coincides with the start of the measurement. At the specified hour/minute/second, the second logging period starts. Subsequent periods will keep in "convenient" synchronisation with the internal clock. See Fig. 3.11 and Fig. 3.12 for more details.

Store BB. (after each sample).:

Can be set to one of the following:

- `All`:
  Each time the sample has run its course, all broadband measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.`:
  As with `All`, but excludes all broadband statistical data.
- `Major Par.`:
  (L_{Aeq}, $L_{C/Lpk(MaxP)}$, L_{AFMAx}, L_{AFMin}, $L_{C/Leq}$, L_{AIm}).
  Frequency weighting C/L depends on set-up (see section 3.3.3).
- `Nothing`:
  No data storage takes place.

Store Spec. (after each measurement).:

Can be set to one of the following:

- `All`:
  Each time the measurement has run its course, all spectrum measurement data will be stored on a previously defined measurement path, see section 3.5.10.
- `w/o Stat.`:
  As with `All`, but excludes only statistical data on $^1/_1$-octave bands or $^1/_3$-octave bands.
- L_{eq}:
  Stores only L_{eq} spectra. Frequency weighting depends on set-up (see section 3.3.3).

- `Nothing`:
  No data storage takes place.

File Structure

Background and event measurements are stored sequentially in the same file as part of the overall log. Examples are shown in Fig. 3.11 and Fig. 3.12.

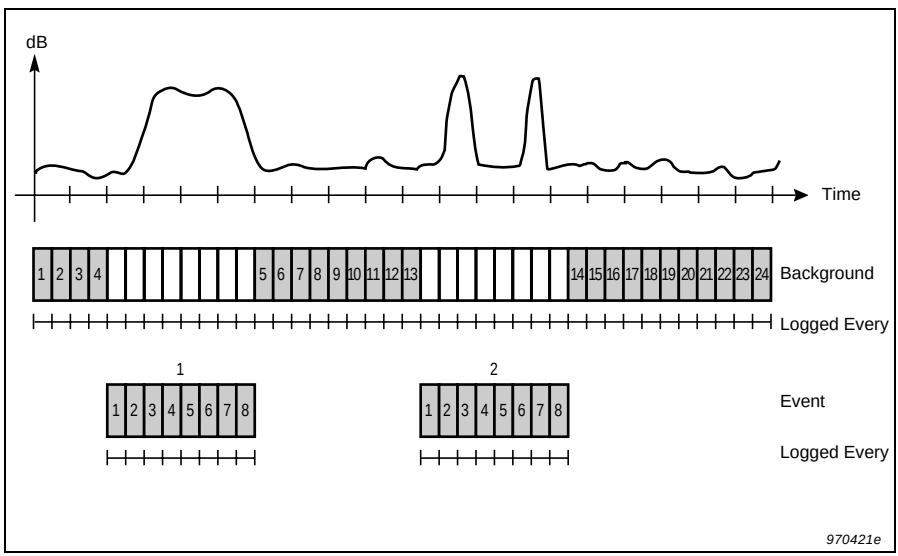

Fig. 3.11 An example data structure of a log file with background and event data, both having the same logging rate

You can see from the examples in Fig. 3.11 and Fig. 3.12 how each block of data is assigned a number. For background blocks, this number is the same as <`Meas. No.`>, and can be recalled for display using the <`Meas. No.`> function.

For event blocks, there are two numbers. The first is the Event No. This is sequentially updated each time a new event occurs, no matter what its duration. Within each event there may be a number of samples, labelled Event Sample No. You

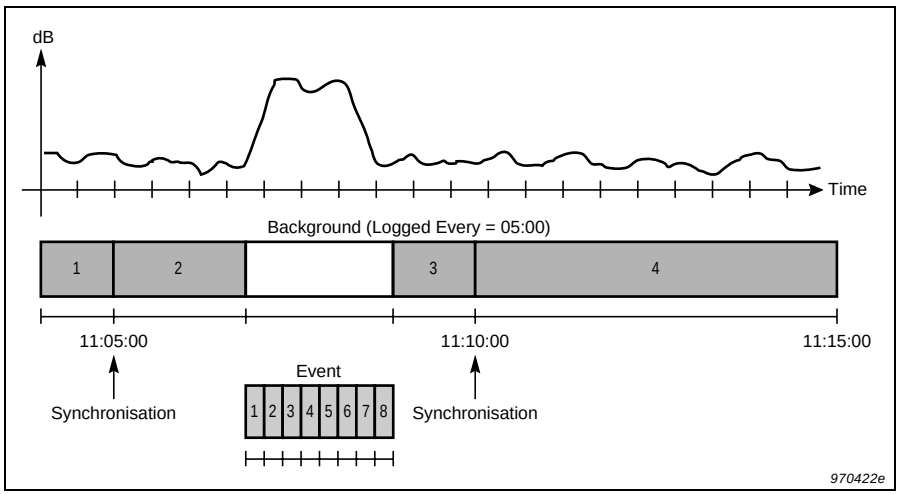

Fig. 3.12 An example data structure of a log file with background and event data, having different logging rates. Note the synchronisation with the internal clock at 11:05:00 and 11:10:00

can display both the whole event or the individual samples by choosing <Event No.> or <Event Sample No.> respectively.

The 2260 Investigator display will show how many background samples have been measured (Meas. No), how many events have occurred (Event No.), and, if recording an event, which sample is being processed (Event Sample No.). See Fig. 3.13. and Fig. 3.14.

Note: When measuring in the background, the Event No. and Event Sample No. fields will be blank. Only when an event occurs do they become active, in which case the Meas. No field becomes inactive.

Displaying Event Measurements

Measurements made with the event logging function are displayed in the same way as other measurements, see Chapter 5.

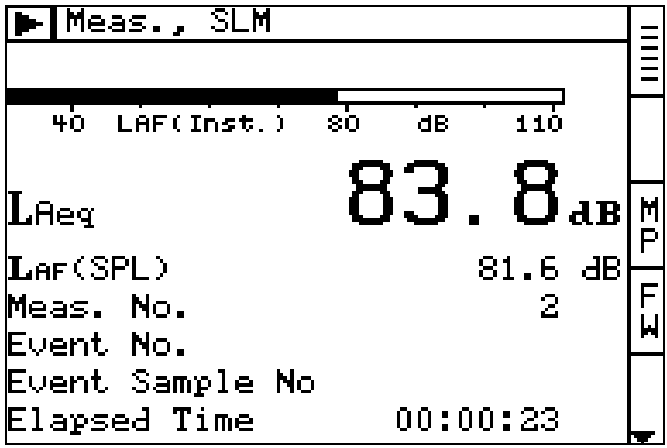

Fig.3.13 2260 screen during background measurement

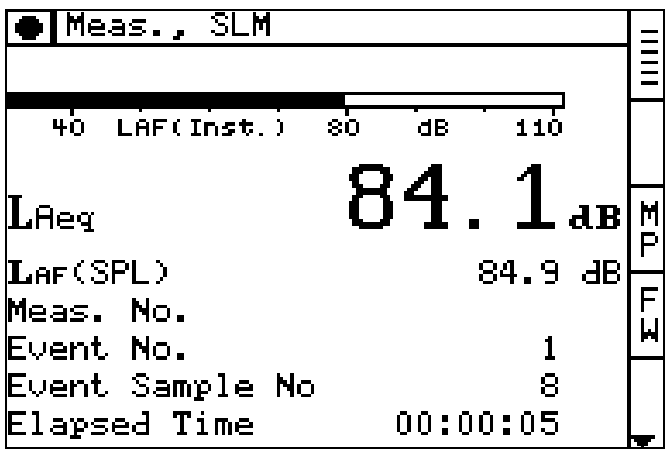

Fig.3.14 2260 screen during recording. Note the event symbol in the upper left corner

3.5.9 Event Triggering (BZ 7206 only)

There are four different types of trigger that can be set for event start:

- External trigger
- Remote trigger
- Softkey trigger
- Level trigger

Only one trigger type can be active at once. Choosing which type is done in the `Event Trig.` screen, accessed from the `Set-up` menu. Fig. 3.16 shows a typical event trigger screen.

Pre- and Post-trigger

All trigger types have the possibility of setting pre- and post-trigger timings. These two functions use the 2260's ability to store the previous 15 seconds of measurement data. By setting a pre-trigger of, say, 2 seconds, you can record in your event block the 2 seconds of data arriving *before* the event took place. Similarly, the post-trigger allows data to be recorded in the event block after the event has finished. In this way you can be sure of recording the whole event. Fig. 3.15 shows the pre- and post-trigger situation graphically.

You can set the pre- or post-trigger to be from 0 to 15 seconds. If this results in overlapping times, (for example if the event is very short), 2260 Investigator will curtail the times appropriately.

External Trigger

The external trigger is input via pin-9 of the 2260 RS–232 interface connector (see Fig. 3.17). Pin-9 is polled by the instrument once per second. The voltage on the pin at polling time determines the trigger state.

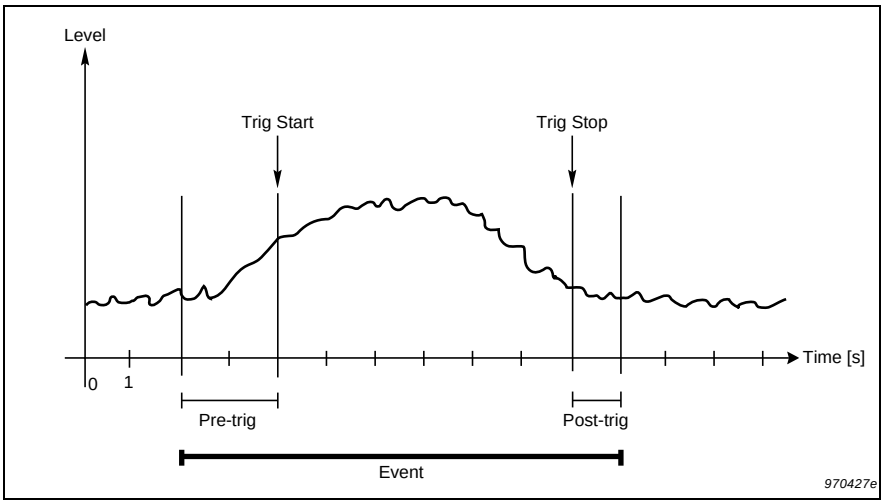

Fig.3.15 Graphical explanation of pre- and post-trigger

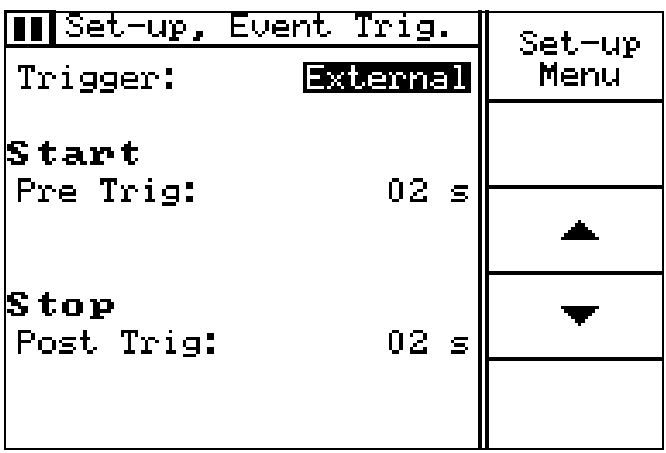

Fig.3.16 External trigger set-up screen

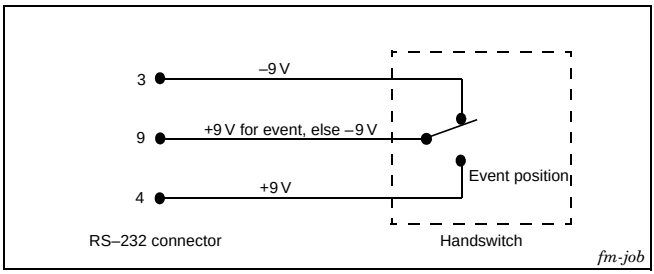

Fig. 3.17 External trigger wiring

Start:

`Pre Trig` can have a value between 0 s and 15 s

Stop:

`Post Trig` can have a value between 0 s and 15 s

Fig. 3.18 shows two events triggered externally.

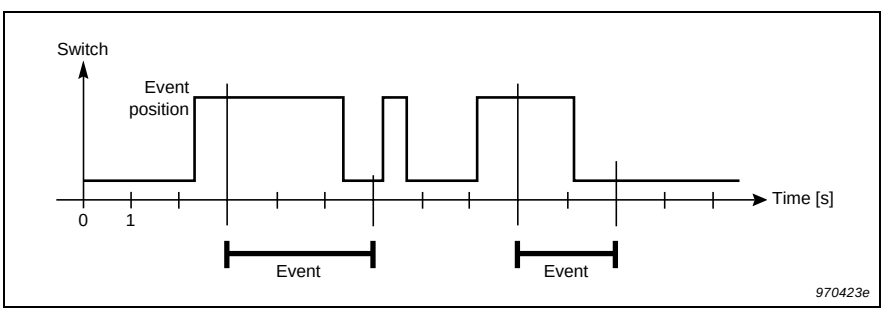

Fig. 3.18 Example time-sequence for an external trigger

Remote Trigger

The remote trigger is activated via commands on the 2260 RS–232 interface.

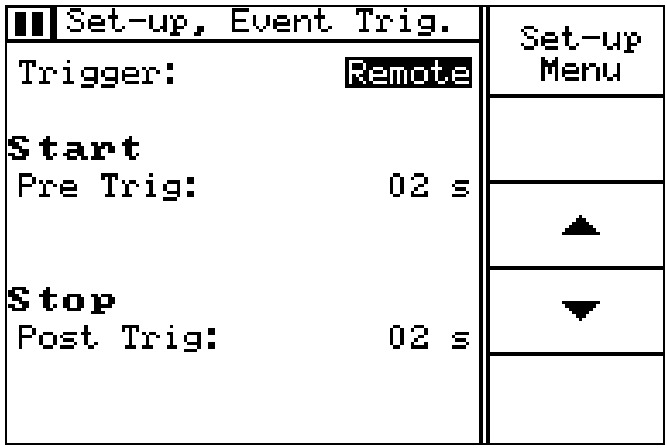

Fig.3.19 Remote trigger set-up screen

- To initiate an event trigger, send the command "Measurement:Start_Event"
- To stop the event, send the command "Measurement:Stop_Event"

Unlike other commands sent over the RS–232 interface, the event trigger commands are interpreted during measurements. Pre- and post-trigger are available.

Start:

`Pre Trig` can have a value between 0 s and 15 s

Stop:

`Post Trig` can have a value between 0 s and 15 s

Fig. 3.20 shows an event triggered by an RS–232 command sequence.

Soft-key Trigger

The soft-key trigger appears as two soft keys and is activated on the `Meas. Profile` screen. The `<Start Event>` soft key

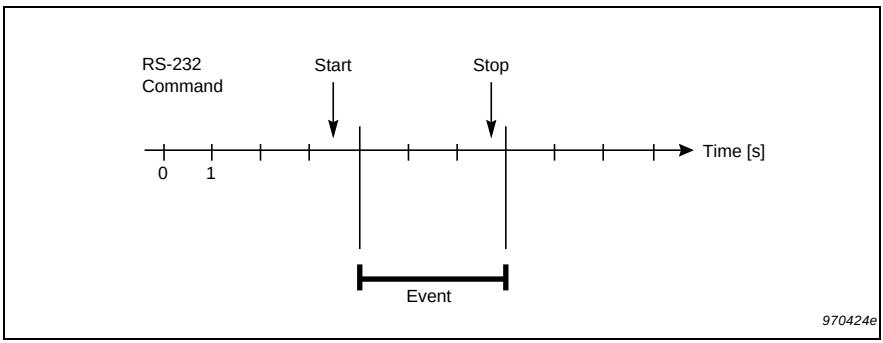

Fig.3.20 Example command sequence for a remote trigger

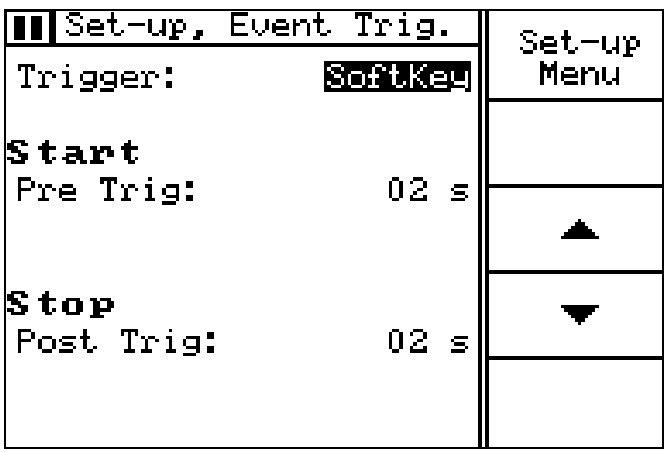

Fig.3.21 Soft-key trigger set-up screen

appears during background measurements and, when pressed, starts an event at the beginning of the next second.

The <Stop Event> soft key appears during event recording and, when pressed, stops the event at the end of the current second.

Start:

`Pre Trig` can have a value between 0 s and 15 s

Stop:

`Post Trig` can have a value between 0 s and 15 s

Fig. 3.22 shows an event triggered by the soft key.

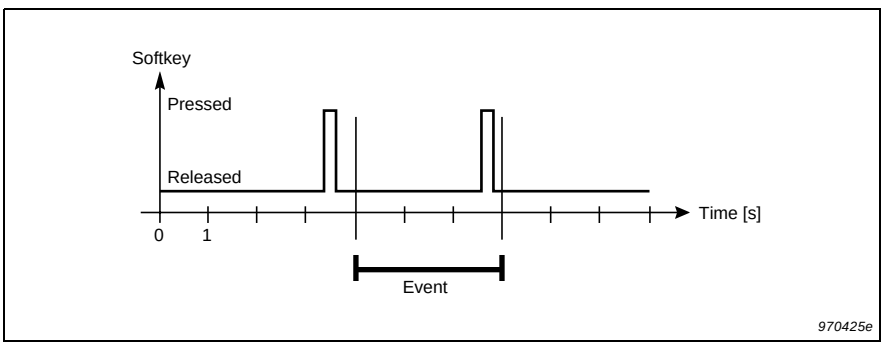

Fig. 3.22 Example time-sequence for a soft-key trigger

Level Trigger

The level trigger is activated when $L_{AF(Inst)}$ exceeds the `Level` value set in the `Start` field for more than the set `Duration`. The event stops when $L_{AF(Inst)}$ falls below the `Level` value set in the `Stop` field for more than the set `Duration`. Pre- and post-trigger are available. $L_{AF(Inst)}$ is sampled 10 times per second.

Start:

`Pre Trig` can have a value between 0 s and 15 s.

`Level` can be set at 1 dB intervals and must be greater than or equal to the `Stop Level`.

`Duration` can be set from 0 to 15 s in 1 s steps.

The sum of `Pre trig` and `Start Duration` can not exceed 15 s.

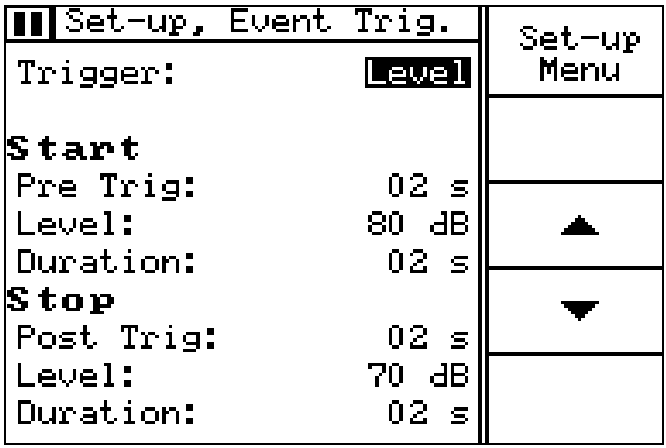

Fig.3.23 Level trigger set-up screen

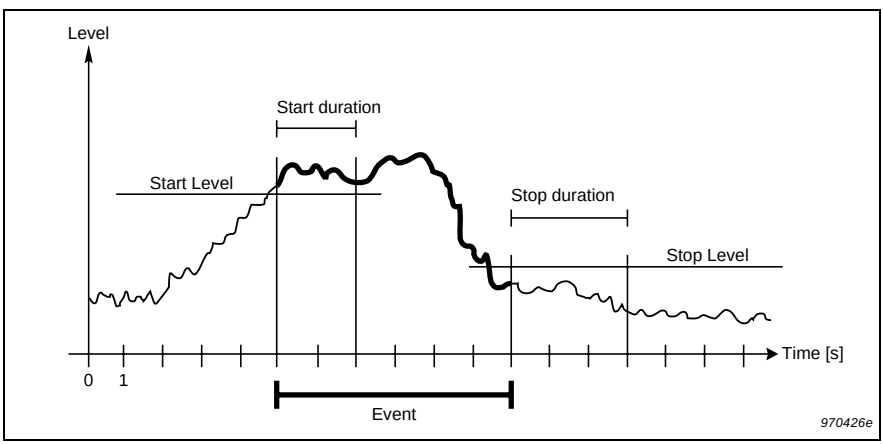

Fig.3.24 Example time-sequence for a level trigger

Stop:

`Post Trig` can have a value between 0 s and 15 s.

`Level` can be set at 1 dB intervals and must be less than or equal to the `Start Level`.

`Duration` can be set from 0 to 15 s in 1 s steps.

The maximum sum of `Post Trig` and `Stop Duration` is 15 s.

Fig. 3.24 shows an event triggered by a level change.

3.5.10 Setting Up the Measurement Path

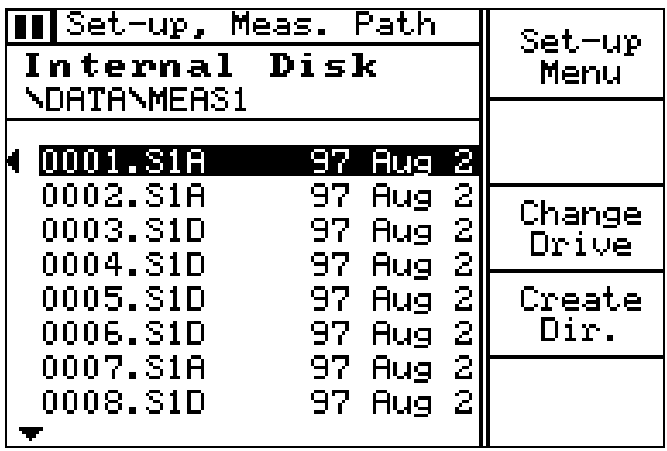

Fig. 3.25 The measurement path menu

At the end of a measurement period, whether it is due to a measurement sequence, a logging or an event logging, the measurement-data files will automatically be stored on the default measurement path which can be seen when Fig. 3.25 is displayed. The same is true when you manually initiate storage via the hard key. You can, however, change this as described in the following.

1. You can start with Fig. 3.5 on display and press the hard key repeatedly until Fig. 3.25 appears.

2. Now use the ◄ ► ▲ ▼ hard keys to highlight the required path. You can even change drive (see section 6.2.2) or create a new directory (see platform's instruction

manual) via the <Change Drive> or <Create Dir.> soft keys.

3. Press the <Save> soft key to confirm your choice of path, otherwise press the <Undo> soft key.

3.5.11 Memory Requirements for Logging

To get an idea of the amount of memory required for logging, assume the following set-up and disk space conditions:

- Func.: Logging
- Store BB: Major Par.
- Store Spec: Nothing
- 17 MB free disk space on a 20 MB disk
- Log LAF: Off (BZ 7206)

Under these conditions, the maximum logging times for various logging rates are as indicated in Table 3.3.

Logged Every:	Max. Log. Time:
1 s	4 days,14 hrs.
3 s	13 days, 18 hrs.
5 s	22 days
10 s	45 days
20 s	91 days

Table 3.3 Maximum logging times for various logging rates

For more complicated set-ups, the software in the 2260 will warn you at the start of measurement if disk space is insufficient. For Meas. Sequence and Logging, one of the following messages may be given:

Insufficient disk
space to complete
measurement

Possibly insuffi-
cient disk space to
complete measurement

Note: This last message may be given when the set-up includes statistics, which require varying amounts of disk space, depending on the range of measured levels.

For Event Logging only, one of the following messages may be given (BZ 7206 only):

Disk space sufficient
only when events
make up less than
XX% of the log. time

Disk space sufficient
only when events
make up MORE than
XX% of the log. time

The last message is relevant when the event set-up is less demanding on memory space than the background set-up.

Note: These are warnings only and do not prevent measurements from being started.

3.6 Setting Up the Sound Level Meter Menu

3.6.1 Introduction

This section will explain how to set up the Sound Level Meter menu for visually monitoring selected measurement parameters while the analyzer is currently making a measure-

ment or paused. Any changes to this set-up will have no effect on the measurements. The display comprises the following (see Fig. 3.26):

- A quasi-analogue display bar
- A main parameter value (shown in large numerals)
- Five secondary parameter values

Apart from the file number and any measurement number, the same display format is also used for data recalled from a disk, see section 3.6.4.

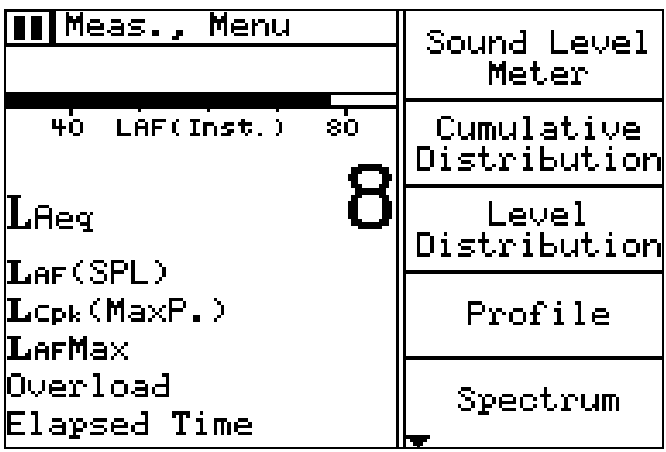

Fig. 3.26 The Measurement Display menu for visually monitoring selected measurement parameters during a current measurement

3.6.2 Setting up the Quasi-analogue Display Bar

Make sure that Fig. 3.26 is on display. If necessary, press the hard key, the ensuing <Display Menu> soft key and then the <Sound Level Meter> soft key to get Fig. 3.27 and a new menu column for the soft keys.

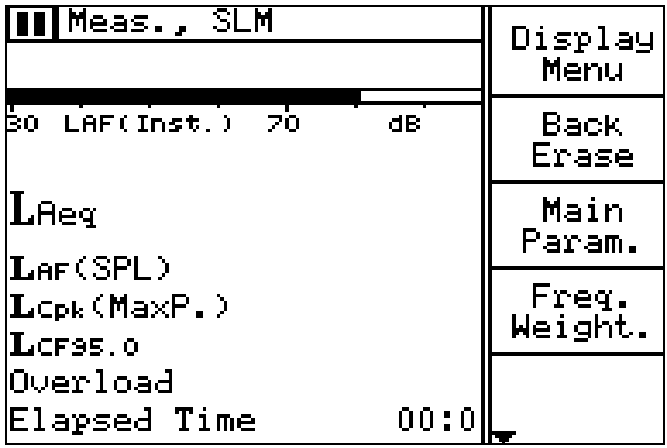

Fig.3.27 The first menu-page of the SLM display

The quasi-analogue display bar is shown in the sound-level-meter display only during current measurements. It can be made to represent one of the following measurement parameters:

L_{Xpk} (Peak)

L_{XY} (Inst.)

where X and Y are respectively the selected frequency and time weightings.

The display range can be toggled between an unzoomed and zoomed range via the <Zoom Bar> soft key. When unzoomed, the display range is fixed by the setting of Range: shown in Fig. 3.3. When zoomed, the display range is set to cover a smaller section of this range. The size of this section can be set by the <Edit Display> soft key (see below) and the position of the section is automatically adjusted to accommodate the currently displayed level (see section 5.4.1) each time the bar is zoomed.

Procedure

1. With Fig. 3.27 on display, ensure via the ▲ and ▼ hard keys that the item `Edit Display` appears in the menu column, then press the <Edit Display> soft key to get the picture shown in Fig. 3.28.

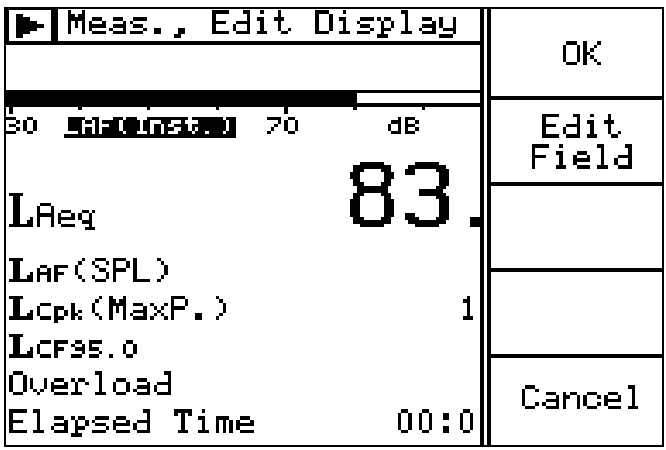

Fig. 3.28 Showing the picture for selecting which measurement-parameter field is to be edited. In this example it is the field of the analogue-display bar

2. Ensure via the ▲ and ▼ hard keys that the text label of the analogue-display bar is highlighted as shown in Fig. 3.28.

3. Now press the <Edit Field> soft key to get the display shown in Fig. 3.29.

4. Select via the <Zoom Range> soft key which setting (`4 dB`, `10 dB`, `20 dB` or `40 dB`) you require.

5. Highlight via the ▲ and ▼ hard keys which item under `Parameter:` you want represented by the analogue-display bar. Use the <Freq. Weight.> and <Time

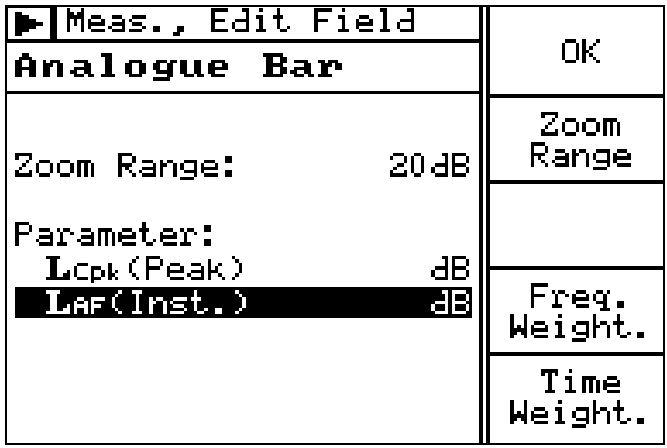

Fig. 3.29 Edit Field menu for selecting the zoom range and which measurement parameter is represented by the analogue-display bar

Weight.> soft keys to select respectively frequency and time weightings.

Note: Since the time weighting for L_{Xpk} (Peak) is always fixed, the <Time Weight.> soft key appears only when L_{XY} (Inst.) is highlighted.

6. When you have made the settings you require, press the <OK> soft key to confirm these and revert to the previous display.

3.6.3 Changing the Parameters on the Display

Editing the List of Main Measurement Parameters

The value of the main measurement parameter is always shown in large numerals. With Fig. 3.27 on display, the main measurement parameter can be step-changed via the <Main Param.> soft key. Alternative choices are taken from a short list prepared as follows.

Procedure

1. With Fig. 3.28 on display, ensure via the ▲ and ▼ hard keys that the main-parameter field is highlighted. Now press the <Edit Field> soft key to get the display shown in Fig. 3.30.

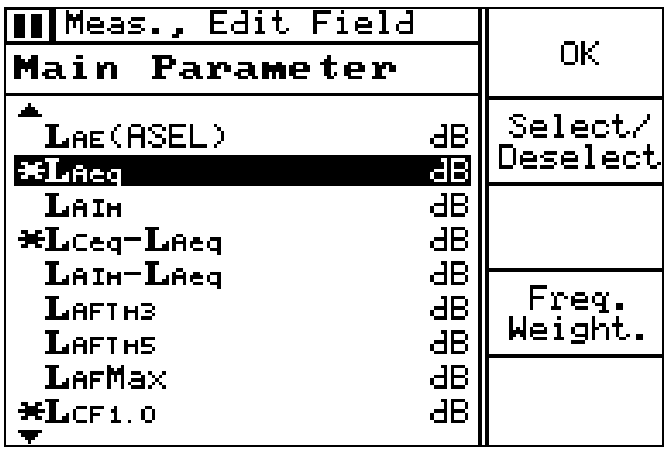

Fig. 3.30 Edit (Main Parameter) Field menu for selecting/deselecting a short list of main parameters. The selected ones are tagged ✳

Fig. 3.30 shows part of the complete list of measurement parameters from which you can make a short list of those needed for display during a measurement. The complete list is shown in Table 3.4. Selected measurement parameters are tagged thus ✳.

2. Use the ▲ and ▼ hard keys to highlight a particular measurement parameter (scrolling is automatic at the top or bottom of the display to show the rest of the list). Now select or deselect it using the <Select/Deselect> soft key.

   While it is highlighted and depending on what it is, change (if required) its units, frequency and time weightings via the <Unit>, <Freq. Weight.> and <Time

Weight.> soft keys which appear only when this is permissible. The choice of units (available only for L_{Xpk} (Peak) and L_{Xpk}(MaxP.)) is either decibels (dB) or pascals (expressed as Pa, mPa or µPa).

Note: Time and frequency weighting can still be selected from the Sound Level Meter display, see section 5.4.

3. Whenever L_{XYN1} to L_{XYN5} or $L_{AEP,d}$ (Te = HH:MM) is highlighted, the only soft keys to appear are < ▲ > and < ▼ >. Use these to increase or decrease the value of either N or Te respectively.

4. When you have made the settings you require, press the <OK> soft key to confirm these and to revert to the previous display.

Editing the List of Secondary Measurement Parameters

Up to five secondary measurement parameters can be selected for display as follows.

Procedure

1. Start with Fig. 3.28 on display and ensure via the ▲ and ▼ hard keys that the field for the secondary-parameter of your choice is highlighted. Now press the <Edit Field> soft key to get the display shown in Fig. 3.31.

   Fig. 3.31 shows part of the complete list of measurement parameters from which to make your choice. The complete list is shown in Table 3.4.

2. Use the ▲ and ▼ hard keys to highlight a particular measurement parameter (scrolling is automatic at the top or bottom of the display to show the rest of the list).

   While it is highlighted and depending on what it is, change (if required) its units, frequency and time weightings via <Unit>, <Freq. Weight.> and <Time Weight.> soft keys which appear only when this is permissible. The choice of units (available only for L_{Xpk} (Peak) and L_{Xpk} (MaxP.)) is either decibels (dB) or pascals (expressed as Pa, mPa or µPa).

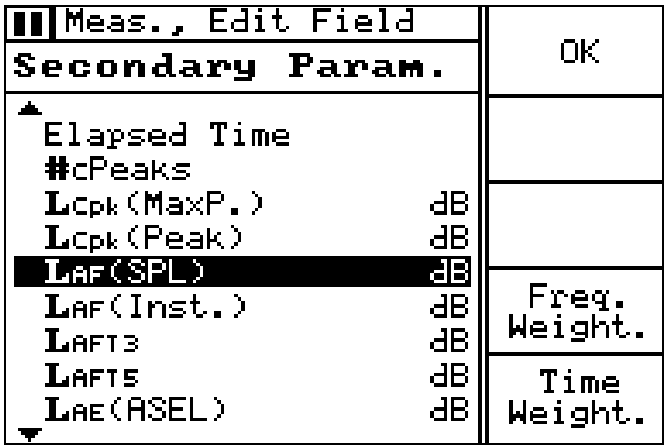

Fig.3.31 Edit (Secondary) Field for selecting a secondary parameter together with its frequency and (where applicable) time weightings

3. Whenever L_{XYN1} to L_{XYN5} or $L_{AEP,d}$ (Te = HH:MM) is highlighted, the only soft keys to appear are < ▲ > and < ▼ >. Use these to increase or decrease the value of either N or Te respectively.

4. When you have made your choice, press the <OK> soft key to confirm this and to revert to the previous display with the measurement parameter installed in the chosen field.

5. Repeat steps 2 to 4 for all five fields to display the measurement parameters of your choice. If you require empty fields to unclutter the display, scroll all the way down in step 3 and select Nothing which is towards the bottom of the list of measurement parameters.

3.6.4 The Display for Recalled Data

When the display shows data that have been recalled (see section 6.3), the file number is shown on the display. When a recalled measurement sequence or logging measurement is

Measurement Parameter	
1	Elapsed Time (see section 3.5.3)
2	$\#_X$ Peaks (> preset level, see section 3.3.3)
3	L_{Xpk} (MaxP.)
4	L_{Xpk} (Peak)
5	L_{XY} (SPL)
6	L_{XY} (Inst.)
7	L_{XYT3}
8	L_{XYT5}
9	L_{AE} (ASEL)
10	L_{Xeq}
11	L_{XIm}
12	$L_{Xeq} - L_{Aeq}$
13	$L_{AIm} - L_{Aeq}$
14	L_{XYTm3}
15	L_{XYTm5}
16	L_{XY} Max
17	L_{XYN1}
18	L_{XYN2}
19	L_{XYN3}
20	L_{XYN4}

Table 3.4 Complete list of measurement parameters. Note: X and Y denote frequency and time weightings respectively

Measurement Parameter	
21	L_{XYN5}
22	L_{XY} Min
23	$L_{AEP,d}$ (see section 2.3.2)
24	Overload %
25	Underrange %
26	No. of Pauses
27	Measurement No.
28	Start Date
29	Start Time
30	Nothing (see step 5 for Fig. 3.31)
31	Stop Date
32	Stop Time
33	Event Number (BZ 7206 only)
34	Event Sample No. (BZ 7206 only)

Table 3.4 (Continued)Complete list of measurement parameters. Note: X and Y denote frequency and time weightings respectively

displayed, the number of the displayed measurement appears next to the file number (see Fig. 3.32).

When an event logging measurement is recalled (BZ 7206 only), the screen shows the file number, plus either the background measurement number or the event number and the sample number within the event, depending on whether the

displayed measurement (sample) belongs to the background or an event (see Fig. 3.34).

When displaying recalled data, the menu column extends over more pages than it does when displaying current measurements (see the examples shown in Fig. 3.32, Fig. 3.33 and Fig. 3.34). Otherwise, the display set-up will be the same as that for current measurements, see section 3.6.3.

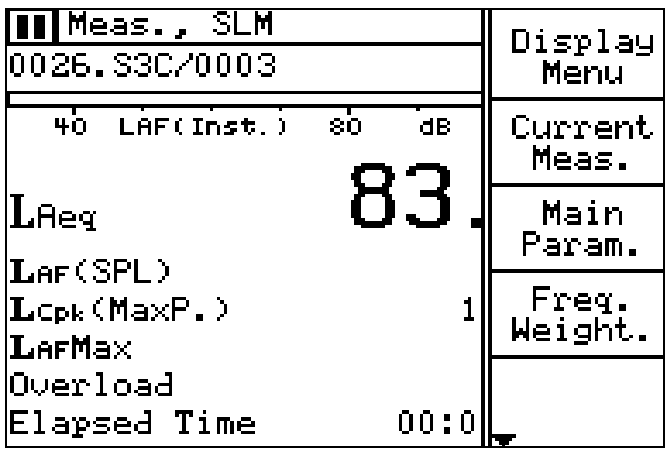

Fig. 3.32 Page 1 of Recall Sound Level Meter menu for examining selected measurement parameters of a recalled measurement

With Fig. 3.32 on display, press the <Current Meas.> soft key to switch back to displaying current measurements.

With Fig. 3.33 on display, increment/decrement the file number using the <File ▲ > and <File ▼ > soft keys to recall next or previous files.

With Fig. 3.33 on display, increment/decrement the measurement number using the <Meas No. ▲ > and<Meas No. ▼ > soft keys to recall the next or previous measurement from a sequence of measurements or from a logging.

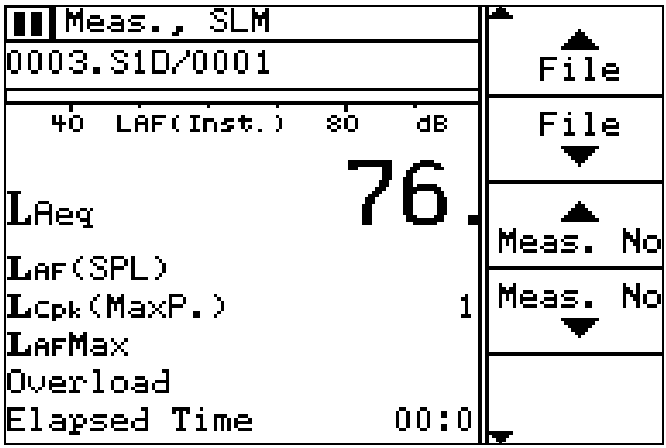

Fig.3.33 Showing the third page of the menu for Fig.3.32 when recalling a measurement sequence or a logging measurement

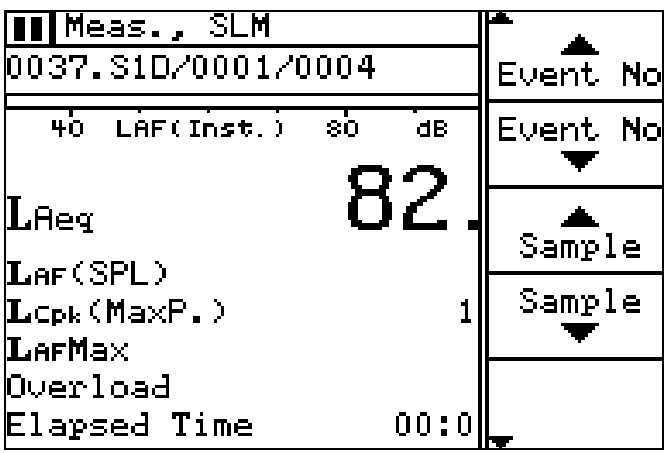

Fig.3.34 Showing the fourth page of the menu for Fig.3.32 when recalling an event logging (BZ 7206 only)

With Fig. 3.34 on display, search forward/backward for the next/previous event using the <Event No. ▲ > and <Event No. ▼ > soft keys to recall the first sample in the next event or the last sample in the previous event (BZ 7206 only).

With Fig. 3.34 on display, increment/decrement the sample number using the <Sample No. ▲ > and <Sample No. ▼ > soft keys to recall the next or previous sample within the current event (BZ 7206 only).

3.7 Setting up the Output

3.7.1 Introduction

The two auxiliary output sockets **Aux. 1** and **Aux. 2** (shown as 21 and 22 on inside rear cover) can be set up independently to deliver one of several different outputs. Some outputs are common to both sockets and others are socket dependent.

These outputs are for tracing a measured level on a level recorder, setting up a level recorder, triggering external equipment such as tape and level recorders, and for aural monitoring using earphones.

3.7.2 Setting up AUX. 1 and AUX. 2 Outputs

Start by pressing the set-up hard key symbolised by ⊣⊢ and get the `Set-up Output` menu (Fig. 3.35) on display.

3.7.3 Range of Settings for AUX. 1 and AUX. 2 Outputs

Fig. 3.35 itemises the output parameters whose settings or values can be changed as described in section 3.3.2. The following describes what they are and how they affect the delivered output.

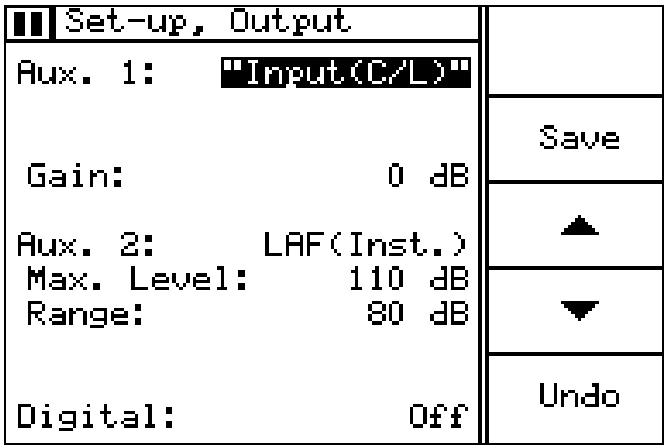

Fig.3.35 The Set-up Output menu for AUX. 1 and AUX. 2 outputs

Aux. 1 and Aux. 2

Note: Battery life can be extended by only activating `Aux.1` or `Aux. 2` as needed.

`Aux.1` or `Aux. 2` can be set to one of the following:

- `Off`
  No output.
- L_{AF} `(Inst.)`
  0 to +4 V in direct proportion to the measured parameter L_{AF} `(Inst.)` and updated every 0.1 s. Used for tracing on a level recorder.

  4 V corresponds with the `Max. Level` setting and
  0 V corresponds with the `Max. Level` setting minus the `Range` setting.

  This output voltage (updated 10/s) can be used to trace the fluctuations of L_{AF} `(Inst.)` on a level recorder.
- `Reference`
  To deliver a reference voltage which switches between 0 and 4 V in order to set up a level recorder for tracing the fluctuations of L_{AF} `(Inst.)`.

- `Meas. Status`
  `Format: High Level`, `Sony TDC-D8` or `Sony TDC-D100` may be selected.

  When `Format` is set to `High Level`, a status voltage switches between 0 and +5 V depending on whether the analyzer is paused (0 V) or proceeding with a measurement (+5 V).

  When `Format` is set to `Sony TCD-D8`, the signal starts/stops recording on Sony TCD-D7 or TCD-D8 tape-recorders during measurement.

  When `Format` is set to `Sony TCD-D100`, the signal starts/stops recording on a Sony TCD-D100 tape-recorder during measurement.

  The `High Level` status voltage can also be used to start/stop external equipment such as tape and level recorders.

- `"Input(C/L)"` Aux. 1 only
  C- or L-weighted analogue signal with adjustable gain for aural monitoring or audio recording. Typically used as the audio channel when remote recording on a DAT machine during a whole measurement.

- `"Input(A)"` Aux. 2 only
  A-weighted analogue signal with adjustable gain for aural monitoring or audio recording.

- `"Event(C/L)"` Aux. 1 only (BZ 7206 only)
  C- or L-weighted analogue signal with adjustable gain for aural monitoring or audio recording. The output is active during events only. Typically used as the audio channel when remote recording events only on a DAT machine.

- `"Event(A)"` Aux. 2 only (BZ 7206 only)
  A-weighted analogue signal with adjustable gain for aural monitoring or audio recording. The output is active during events only.

- `Event Status` (BZ 7206 only)
  `Format: High Level`, `Sony TCD-D8` or `Sony TCD-D100` may be selected.

When Format is set to High Level, a status voltage switches between 0 and +5 V depending on whether the analyzer is paused (0 V) or an event is happening (+5 V).

When Format is set to Sony TCD-D8, the signal starts/stops recording on Sony TCD–D7 or TCD–D8 tape-recorders during an event.

When Format is set to Sony TCD-D100, the signal starts/stops recording on a Sony TCD–D100 tape-recorder during an event.

Typically Event Status set on Aux. 2 will be used as the DAT recorder remote control via a special remote control cable (see Ordering Information).

- Limited Event (BZ 7206 only)
  Format: High Level, Sony TCD-D8 or Sony TCD-D100 may be selected.

  When Format is set to High Level, a status voltage switches between 0 and +5V depending on whether the analyzer is paused (0 V) or an event is happening (+5 V).

  When Format set to Sony TCD-D8, the signal starts/stops recording on Sony TCD-D7 or TCD-D8 tape-recorders during an event.

  When Format set to Sony TCD-D100, the signal starts/stops recording on a Sony TCD-D100 tape-recorder during an event.

  The duration of the recording is limited by the Max. Duration parameter in the Set-up, Output menu.

  Max. Duration can have a value from 1 s to 100 minutes in 1 s steps.

  This status voltage can be used to start/stop external equipment such as a DAT recorder and would typically be used where you wish to conserve the recording media. For example, you may not need to record all of an event to determine its character. Therefore, you can set the Limited Event value to, say, 30 s. Then the pulse (and hence the record time) will be limited to 30 s, even if the event lasts 7 minutes.

Digital

- Permanently set to `Off`
  Not used in this application.

3.7.4 Setting up the Level Recorder

The basic points to remember are:

- The level recorder must be set up to record DC voltages linearly. Therefore switch it to a **DC Lin** mode or equivalent.
- Use a suitable balanced cable (for example AO 0440) between the level recorder input and the analyzer's **Aux. Output.**
- For convenience, select a `Range` (see section 3.7.3) which matches the range represented by the graduated width of the chart paper used on the level recorder, for example 50 dB.

Calibrating

While the analyzer switches between 0 and 4 V (see section 3.7.3), adjust the **DC Lin Position** (or DC offset) and **Sensitivity** of the level recorder as follows and in the following order:

- for 0 V and via the **DC Lin Position**
  ensure that the pen travels to the bottom of the chart.
- for 4 V and via the **Sensitivity**
  ensure that the pen travels to the top of the chart.

After this, the top of the chart will correspond with the `Max. Level` setting and the bottom of the chart will correspond with the `Max. Level` setting minus the `Range` setting.

Chapter 4

Measuring

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4.1 Introduction

This chapter will explain:

- How to make a measurement
- What calibration methods are available
- How to calibrate the analyzer
- The consequences of resetting the analyzer
- Manual control during a measurement
- Automatic control of the analyzer
- How to delete bad data from a measurement

4.2 Making a Measurement

A typical standard noise measurement procedure consists of the following three basic steps:

1. Calibration
2. Measurement
3. Calibration check

One of the many factors affecting the acceptability of results will be the magnitude of any calibration drift during a measurement, hence steps 1 and 3 above. The analyzer is able to report this as a matter of course.

4.2.1 Practical Hints

The sound level meter is designed as a self-contained unit to meet the requirements given in IEC 60651, IEC 60804 and similar national standards. However, some of the requirements given in the standards are based on measurements of pure tones under free field conditions. Practical measure-

ments under similar conditions require the following extra precautions:

- Use a tripod whenever possible
- Do not stand close to the sound level meter
- Use, if necessary, a recommended microphone extension cable (see section 3.2), this increases the distance between the microphone and any objects which can cause disturbances.

The influence of your presence on the measurement can easily be checked by changing the distance between you and the microphone and observing the change in the measured sound pressure level. If your position influences the measurement result, then use a microphone extension cable or spatially average your measurements. Note that, when dealing with pure tones, a small change in the position of the microphone can influence the result just as much as your physical presence.

Fortunately, the combination of free sound field and pure tones is very rare. With sound coming from several directions and if you are measuring over a broad frequency band, the influence of the sound level meter's housing, tripod and user becomes insignificant, and the above precautions need not be taken.

Note: When mounting the analyzer on a tripod, position the tripod so that one of its legs points in the same direction as the microphone. This will reduce the risk of damaging the microphone if the tripod is accidentally knocked over.

4.2.2 Changing the Measuring Range

The measuring range is always fixed throughout a measurement and, because of the large dynamic range of the analyzer, rarely requires changing.

If you make a range change during a measurement, you will have to decide whether to save or delete the data so far

collected. For the sake of measurement continuity, no range changing is allowed within the same measurement.

To make a range change, press the dB hard key to get the display shown in Fig. 4.1. As long as the <Cancel> soft key is in the menu column, you can press it to return to the previous display without interruption or loss of data during a measurement.

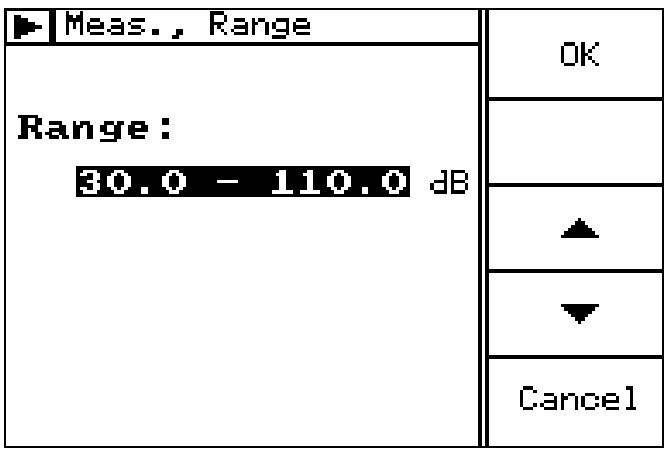

Fig. 4.1 Range menu for making changes to the range setting during a measurement

Use the < ▲ > and < ▼ > soft keys to raise/lower the range as required. To confirm your choice press the <OK> soft key. There are two possible outcomes to this if the elapsed time of a measurement has exceeded one minute:

1. You will be warned that all data up to now will be lost and the analyzer will automatically reset and (if a measurement is in progress) restart the measurement with the new range setting. If you accept this press the <OK> soft key.

   OR

2. You can press the <Cancel> soft key and nothing will happen.

If the elapsed time is under one minute, no warnings will appear and range changing with automatic reset/restart will occur without user-dialogue.

If, however, you want to store the data of whatever has so far been measured before changing the range setting, pause the analyzer via the hard key and store the data via the hard key (see section 6.2). After this change the range setting and allow the measurement to restart as described in 1 above.

4.3 Calibration Practice and Theory

4.3.1 Introduction

A calibration can be made only while the analyzer is in pause, that is whenever the pause symbol appears in the top left-hand side of the screen in the status line. If necessary, use the hard key to ensure this.

Remember to calibrate before and not during a measurement. This is because a calibration adjusts the sensitivity of the analyzer and invalidates the current measurement. Therefore, trying to continue with the measurement afterwards by pressing the hard key will not work. Instead, you must start the measurement again by pressing the hard key.

4.3.2 The Brüel & Kjær External Calibrators

To calibrate the analyzer acoustically, a reference sound source must be used to apply a known sound level to the microphone. A reference sound source could be a Sound Level Calibrator Type 4231, a Multifunction Acoustic Calibrator Type 4226 or a Pistonphone Type 4228. Acoustic calibration is the only complete calibration which ensures correct measurement results.

Note: When the analyzer is in its calibrate mode, it automatically selects C-weighting. This allows it to suppress low-frequency noise but still respond linearly to the signal of any of the external reference sound sources (or equivalents) mentioned in the following.

Sound Level Calibrator Type 4231

This is a calibrator for sound level meters and any other sound measuring equipment requiring calibration in the field. It is a reference sound source of 1 kHz at 94 dB or 114 dB. For free-field microphones (for example the type 4189), the corresponding levels are 93.9 dB and 113.9 dB. It is pocket-sized, battery-powered and conforms to IEC 942 Class 1 and ANSI S1.40-1984.

Multifunction Calibrator Type 4226

This is a calibrator for microphones, sound level meters, noise dose meters and any other sound measuring equipment requiring stable and accurate sound references at various levels and frequencies. It provides calibration levels of 94 dB, 104 dB and 114 dB at discrete frequencies starting at 31.5 Hz and increasing in octaves to 16 kHz. It is also capable of checking the crest factor handling and time weighting of a sound level meter. It is small, battery-powered and conforms to IEC 942 Class 1 and ANSI S1.40-1984.

Pistonphone Type 4228

This is a laboratory standard, reference sound source which produces 124 dB (nominally) at 250 Hz. It is small, battery powered, individually calibrated and conforms to IEC 942 Class 1L (Class 0L with suitable external barometer) and ANSI S1.40-1984.

4.3.3 Internal Calibration

If an external sound source is not available, you can calibrate the analyzer using its internal calibration facility. An internal calibration does not take the microphone into account.

This method applies a stable, internally generated 1 kHz signal to the input stage (microphone preamplifier) and the calibration is based on the microphone's sensitivity keyed in by the user.

4.3.4 Charge Injection Calibration (CIC) (BZ 7210 and BZ 7206 only)

If an external sound source is not available, you can *check* the calibration of the analyzer using its CIC facility. Unlike an internal calibration, CIC takes the microphone into account. The results that a CIC check produces allow you to verify if the last acoustic calibration is still valid, or if something has happened to the microphone, preamplifier, cabling or the main instrument. A guide to fault diagnosis with CIC is given below.

The Brüel & Kjær patented Charge Injection Calibration (CIC) technique enables a complete measurement chain to be verified, including the microphone. As the name implies, the method uses frequency independent injection of charge into the microphone and preamplifier input circuit.

Theory of CIC

When you perform an External Calibration on a microphone (specified or unspecified), or an Internal Calibration on a microphone (unspecified only), a reference CIC is also automatically made and the result stored as a reference. Later you may initiate a CIC and compare to the reference. A stable CIC ratio assures stable operation of microphone, cable, preamplifier and the remaining measurement system (see Fig. 4.2).

Practical Implications of CIC

For 2260 Investigator, frequent use of a precision acoustic calibrator (see section 4.3.2) is the ideal means of calibration verification, although this can involve practical and economical disadvantages, for example, difficulty of access, the time involved and disassembly. Used in the right way, the CIC technique has the advantage that it can be used to increase

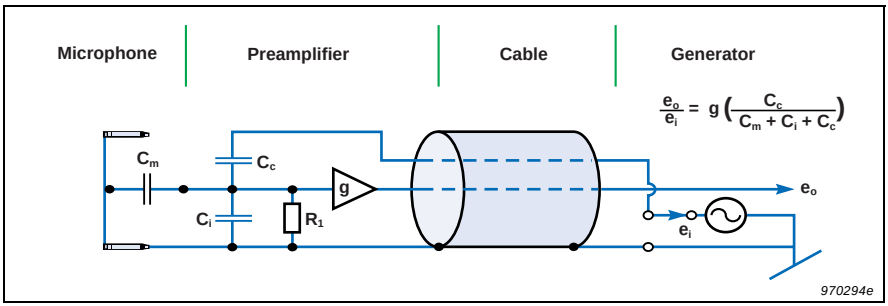

Fig. 4.2 Charge Injection Check. High-leakage resistance capacitor C_c *is set in parallel with the microphone and fed with voltage* e_i. *The ratio* e_o/e_i *is constant when* g, C_c, C_m *and* C_i *are constant. Changes to preamplifier gain (*g*), cable parameters, microphone capacitance (*C_m*), etc., will change* e_o/e_i, *and hence indicate probable changes in calibration*

the interval between costly acoustic calibrations or when doing lengthy unattended measurements in the field. However, an acoustic calibration can never be completely replaced by an electrical test facility.

Fault Diagnosis with CIC

Whenever an external acoustic calibration is made, a reference Charge Injection Calibration ratio is measured and stored. When a Charge Injection Calibration check is done*, a new ratio is measured and compared to the reference ratio. The deviation is an indication of the stability of the measurement chain in the analyzer. If the deviation is greater than the expected errors due to atmospheric variation and measurement repeatability (approximately 0.2 dB and 0.1 dB respectively), then there may be a problem. Likely causes and remedies are:

- Changed microphone or input stage with respect to those used during calibration. Recalibrate.

* Either manually or as part of a logging or event logging set-up

- Malfunctioning microphone. Check connections or replace.
- Malfunctioning input stage or mic. ext. cable. Check connections or replace.
- Error in 2260. Contact your local representative or service centre.

The following examples (Fig. 4.3 to Fig. 4.6), obtained using a white noise signal as the CIC input, graphically show various possible reasons for change.

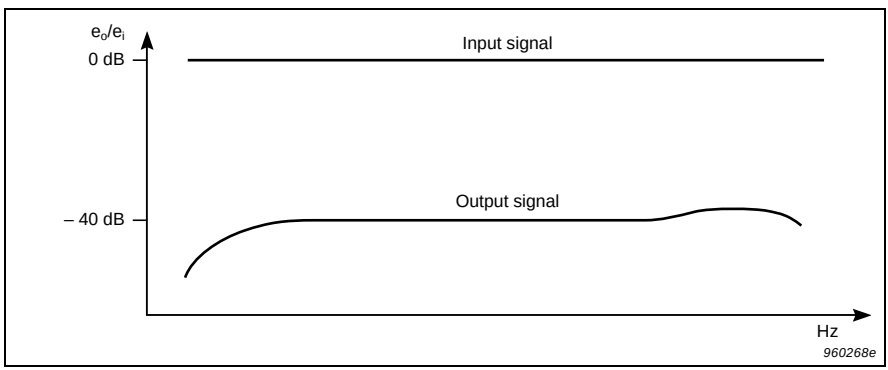

Fig. 4.3 Normal working condition. Notice the attenuation of approximately 40 dB in the mid frequency range. The low frequency roll-off is caused by the preamplifier input resistance

4.4 Calibration

4.4.1 Introduction

When to Calibrate

Most standards recommend that you calibrate the analyzer before each set of measurements (see section 4.4.2) and check the calibration after each set (see section 4.4.4).

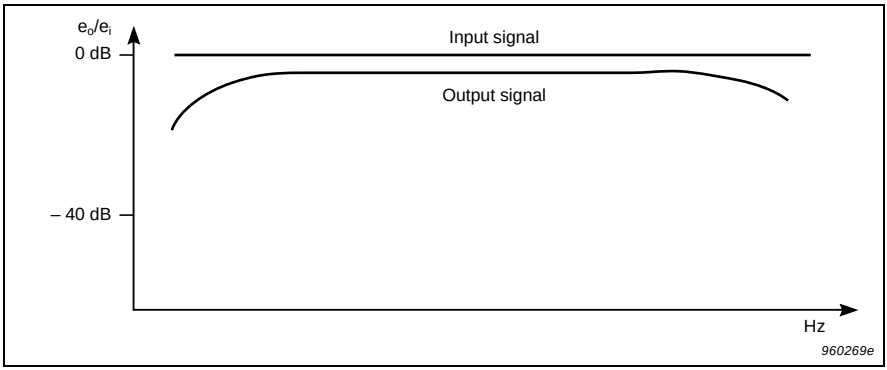

Fig. 4.4 No microphone attached or diaphragm torn or missing. The output level is significantly increased due to reduced microphone capacitance

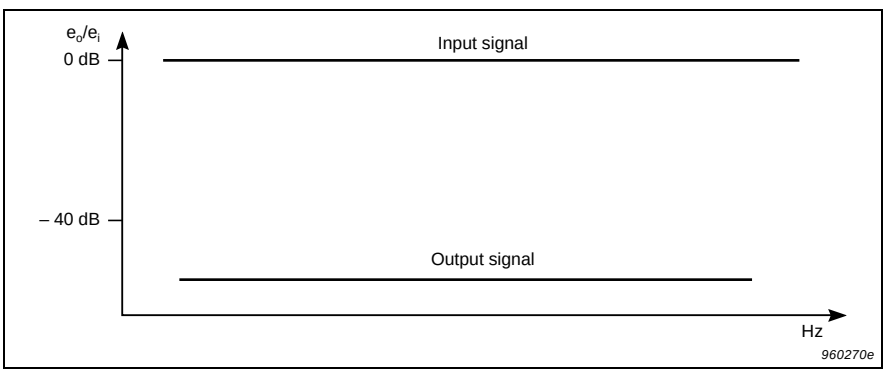

Fig. 4.5 Microphone short circuited. The output level is significantly reduced relative to the normal condition

Connecting a recommended microphone extension cable (see section 3.2) has no effect on the analyzer's calibration. Therefore, you do not have to re-calibrate after connecting one of the recommended microphone extension cables.

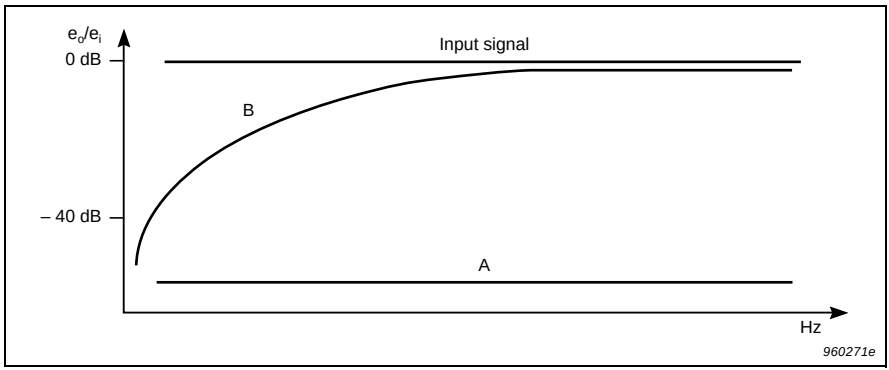

Fig. 4.6 Disconnected or broken cable. The output level will change significantly depending on the distance between the conditioning amplifier and the break in the cable. A: cable broken near to power supply. B: cable broken near to the microphone

Principle of Operation

When in the calibrate mode, the analyzer displays the calibration level and microphone sensitivity used for the previous calibration. Adjust, if necessary and accordingly, either value then press the `<Calibrate>` soft key. The analyzer will then proceed with an internal calibration of its D/A and A/D converters, and afterwards, if external calibration has been selected, will be ready to proceed with this (that is, to adjust itself to the calibration level you have entered).

During the calibration procedure, the analyzer is automatically set to a reference measurement range decided by the calibration level as sensed by the analyzer, Table 4.1 shows what this will be for various calibration levels.

Sensed Calibration Level	Reference Measurement Range
124 dB	50 dB to 130 dB
114 dB	50 dB to 130 dB
104 dB	40 dB to 120 dB
94 dB	30 dB to 110 dB

Table 4.1 Measurement range settings for various calibration levels and a nominal Type 4189 microphone

Calibrating for Free-field or Diffuse-field Measurements

The analyzer is calibrated in the same way for free field measurements (according to IEC) and diffuse field measurements (according to ANSI). However, the calibration levels for some calibrators may be different, depending on which measurements are to be made. See the calibrator's user manual for more details.

Each individual calibrator is slightly different. The actual calibration level is not necessarily equal to the nominal calibration level. It is, therefore, important to set the calibration level to the one given on the calibration chart for the calibrator used.

4.4.2 Calibrating the Analyzer

Sound Level Calibrator Type 4231 provides a nominal pressure-field calibration signal of 94 or 114 dB at 1 kHz. The nominal random-incidence, or diffuse-field, calibration signal is also 94 or 114 dB but the nominal free field calibration signal is 93.9 or 113.9 dB when used with the Type 4189 microphone.

Pistonphone Type 4228 provides a nominal calibration signal which is 124 dB. Since it operates at 250 Hz, there is no difference in calibration level for free or random-incidence fields.

Multifunction Acoustic Calibrator Type 4226 provides a nominal calibration signal of 94, 104 or 114 dB at a range of frequencies.

For day to day calibration, you need only to calibrate at one level and one frequency. In order to comply with most standards, calibrate the analyzer with a reference signal of 94 dB at 1 kHz.

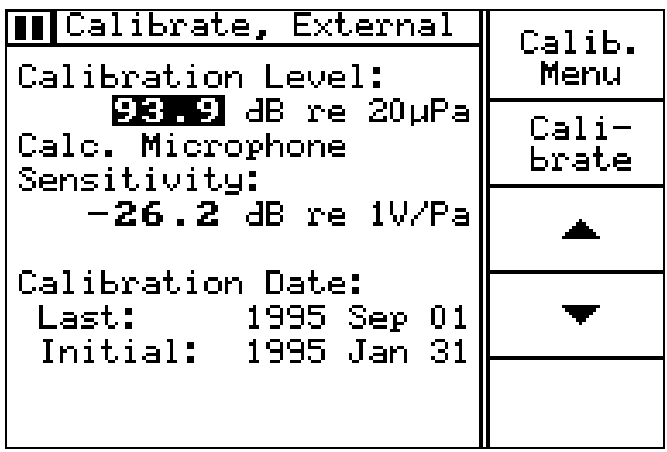

Fig. 4.7 External Calibrate menu

Procedure for External Calibration (Microphone Input with registered serial number and Initial Calibration)

Important: make sure that the proper microphone input is selected and the analyzer is set up to provide the correct polarization voltage for the microphone in use. See section 3.4.

1. Press the hard key to get a calibrate menu. There are three possibilities, and the one that comes up is the one used last time (together with settings and values). All will have a <Calib. Menu> soft key in the menu column. If the display does not resemble Fig. 4.7, press the <Calib. Menu> soft key and on the subsequent display press the <External> soft key to get Fig. 4.7.

2. Use the < ▲ > and < ▼ > soft keys to adjust the value of the Calibration Level to match the external reference level. The example shown in Fig. 4.7 is the default value which applies to a Sound Level Calibrator Type 4231*.

   The adjustment range of the Calibration Level is from 0.0 dB to 200.0 dB re 20 µPa. At first, it will always have the previously used value (in the case of Fig. 4.7, 93.9 dB).

   Fig. 4.7 also shows the dates for the Last and Initial calibrations. See note after step 7.

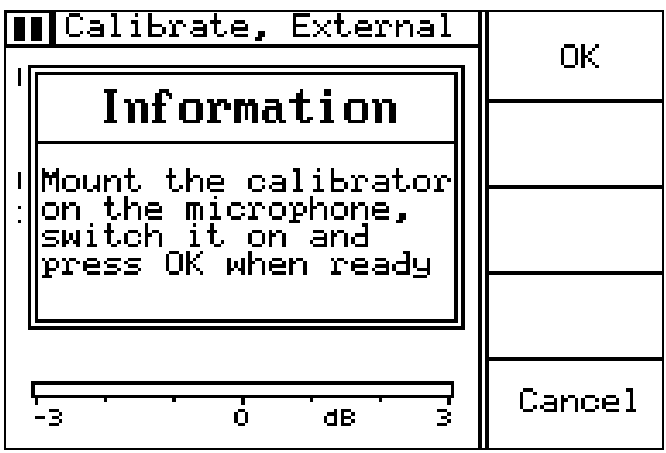

Fig. 4.8 Calibrate External menu inviting you to proceed with the next step

* For Sound Level Calibrator Type 4231, 94 dB for diffuse field or 93.9 dB for free field. For Multifunction Acoustic Calibrator Type 4226, 94 dB for both diffuse and free field. For Pistonphone Type 4228 the nominal value is 124 dB for both diffuse and free field.

3. Press the <Calibrate> soft key and wait until the internal calibration of the A/D and D/A converters is done and Fig. 4.8 appears.

4. Carefully mount the calibrator on the microphone and make sure it is a snug fit, see Fig. 4.9. Rest the analyzer on a table or other flat surface.

5. If you are using a multifunction acoustic calibrator, set it up to calibrate at 94 dB at 1 kHz (see the calibrator's instruction manual).

Fig. 4.9 Fitting Sound Level Calibrator Type 4231 onto the analyzer

6. Switch the calibrator on, the quasi-analogue bar at the bottom of the display will follow any level fluctuations, wait until these have stabilised and then press the <OK> soft key to start the calibration.

   At this stage the analyzer will search for a 20 dB attenuation to determine whether the ZF 0023 is mounted or not. You will be given the chance to rectify this.

7. When the screen shown in Fig. 4.10 appears, remove the Calibrator and press OK to continue with the reference CIC (BZ 7210 and BZ 7206).

   When the calibration is over, Fig. 4.11 will be displayed.

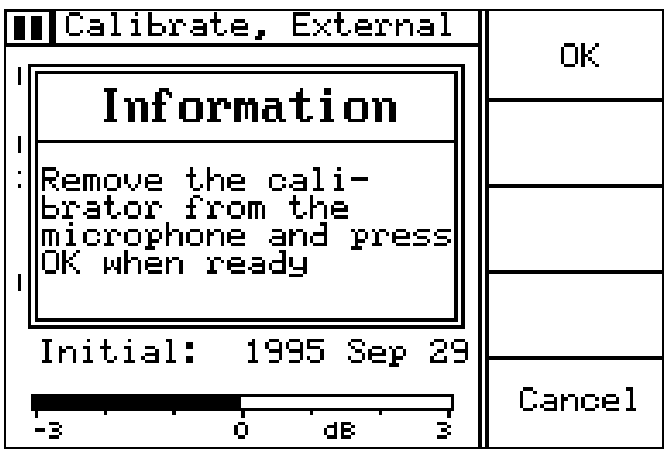

Fig. 4.10 Calibrate External menu inviting you to proceed with the next step

8. Fig. 4.11 shows the results of the new calibration in terms of any Deviation from initial and last calibration and a newly Calc. Microphone Sensitivity. At this stage you can either:

   - Accept this by pressing the <OK> soft key, in which case Fig. 4.7 will be re-displayed modified accordingly.

     OR

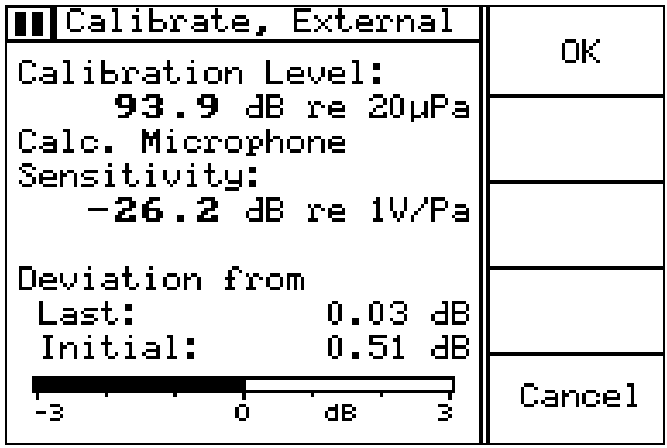

Fig.4.11 Showing the results of a new external calibration in terms of a new microphone sensitivity and deviation from Last and Initial calibrations

- Reject this by pressing the <Cancel> soft key, in which case Fig.4.7 will be re-displayed unmodified.

Note: The earliest initial calibration of the analyzer with its microphone is done by Brüel & Kjær before leaving the factory (applies to all type 2260's from serial number 1875363 and above). If the deviation from an initial calibration lies outside ± 1.5 dB, you will be asked whether the microphone has been changed. If your answer is Yes, the calibration will cancelled and you will be asked to select the input for an unspecified microphone (see section 3.4.3.) If there is no reason to answer Yes, the calibration will be cancelled, in which case you should consult your local Brüel & Kjær representative.

Procedure for External Calibration (Microphone Input with unspecified serial number)

Important: Make sure that the proper microphone input is selected (serial number Unspec. for analyzers with a registered Initial Calibration) and the analyzer is set up to provide

the correct polarization voltage for the microphone in use. See section 3.4.

The procedure is similar to that described above for a registered microphone input, but with no mention of an Initial Calibration in steps 2 and 8. Neither will there be any check for deviation from the Initial Calibration. In step 6 there will be no check on the presence of a ZF 0023.

Procedure for External Calibration (AC Input)

Important: Make sure that the analyzer is set up for an AC input. See section 3.4.

Note: CIC is not available for External Calibration of AC Input

The procedure is similar to that described above for a registered microphone input, but with no mention of an Initial Calibration in steps 2 and 8. Instead of applying a calibrator to the microphone (steps 4 to 6), apply the calibration signal to **both** of the **AC Input** sockets. In step 6 there will be no check on the presence of a ZF 0023 and no reference CIC as in step 7.

Tip: If, during measurements, you wish (via **AC Output**) to make a tape recording for later analysis, remember first to record at least one minute of the calibrator's signal when calibrating the microphone. On playback, use the calibrator's recorded signal for calibrating the analyzer (via **both AC inputs**) before analysing recordings made during the measurements. Furthermore, remember to account for any playback gain as well as any gain differences between recording the calibrator signal and recording the noise signals.

Procedure for Internal Calibration

Note: This should be used only for an input from an unspecified microphone (because no change in microphone sensitivity is admitted for a registered microphone). See section 3.4. You can, however, use an internal calibration in connection with a registered microphone only for adjusting the A/D and D/A convertors.

1. Press the hard key to get a calibrate menu. There are three possibilities, and the one that comes up is the one used last time (together with settings and values). All will have a <Calib. Menu> soft key in the menu column. If the display does not resemble Fig. 4.12, press the <Calib. Menu> soft key and on the subsequent display press the <Internal> soft key to get Fig. 4.12.

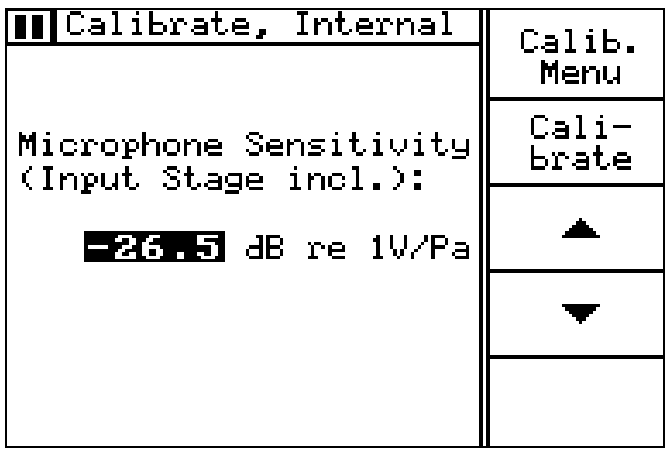

Fig. 4.12 Internal Calibrate menu for internally calibrating the analyzer

Fig. 4.12 shows the last-used sensitivity value or, if the last calibration was external, the calibration result. If the last calibration was with a registered microphone, all you can do at this stage is to go directly to step 3. Otherwise go to step 2.

2. Use the < ▲ > and < ▼ > soft keys to enter the value of the Microphone Sensitivity which takes into account the effect of the Input Stage ZC 0026. For a Type 4189 microphone, subtract 0.5 dB from the microphone's open-circuit sensitivity.

   The example shown in Fig. 4.12 is typical of Microphone Type 4189.

3. Press the <Calibrate> soft key to start the calibration which also adjusts the A/D and D/A convertors. You can still cancel by pressing the <Cancel> soft key and return to Fig. 4.12. A reference CIC is also done (unspecified microphone only and BZ 7206 or BZ 7210 only). When the calibration is over, Fig. 4.13 will be displayed.

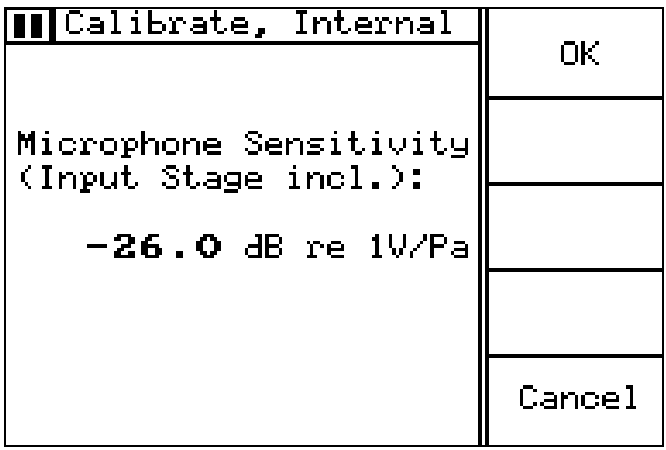

Fig. 4.13 Internal calibrate menu and results after an internal calibration

4. Fig. 4.13 shows the results of the new calibration. At this stage you can either:
   - Accept this by pressing the <OK> soft key

     OR
   - Reject this by pressing the <Cancel> soft key

   In either case Fig. 4.12 will be re-displayed.

Procedure for Manual Charge Injection Calibration Check (BZ 7210 and BZ 7206 only)

1. Press the hard key to view the calibrate menus. All have a <Calib. Menu> soft key. If the display does not

resemble Fig. 4.14, press the <Calib. Menu> soft key and press the <Charge Inject. Cal.> soft key.

Fig. 4.14 shows a typical Reference CIC ratio screen.

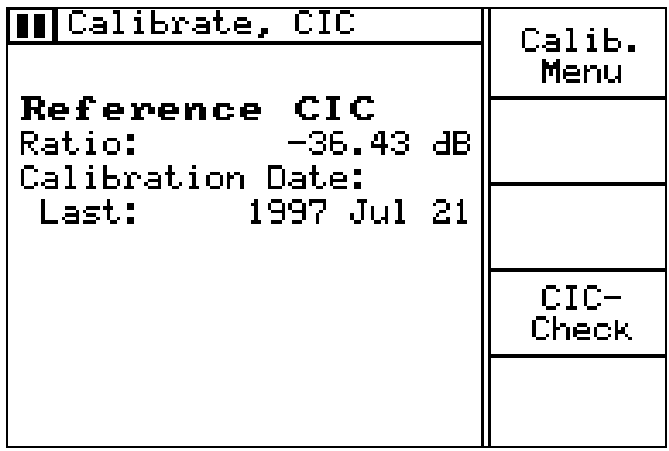

Fig. 4.14 CIC Calibrate menu for Charge-Injection Calibration check. The reference CIC ratio is the one obtained at the last external or internal calibration with a microphone selected as a source

2. Press the <CIC-Check> soft key to start the Charge-Injection Calibration check.

When the calibration check is over, Fig. 4.15 will be displayed.

The Ratio: fields show the difference between the output and input levels in dB. Typically ratios lie between –35 dB and – 40 dB. If the signal/noise ratio of the CIC measurement is too low, an asterisk (*) appears beside the Ratio: field.

The difference between the reference CIC (obtained during the last external or internal calibration) and the one you have just done is shown in the Deviation from Reference: field.

For an indication of how the magnitude of the deviation affects the verification of the CIC check, see section 4.3.4.

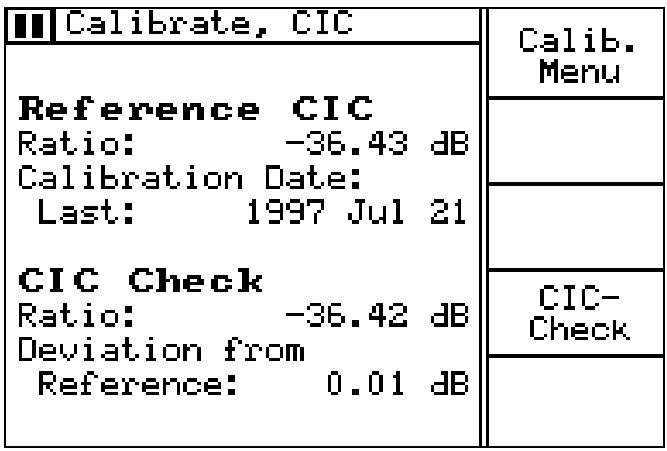

Fig. 4.15 CIC calibrate menu and results after CIC check

The results of a manual CIC check are not stored. The CIC check `Ratio:` and `Deviation from Reference:` fields are always blank when first displaying the screen. Storage only occurs for automatic CIC checks (see below).

Procedure for Automatic Charge Injection Calibration Check (BZ 7210 and BZ 7206 only)

Note: Automatic CIC checks can only be done when the analyzer is in Logging or Event Logging function, and then only if `Microphone` is chosen as the input source.

On the `Set-up` screen for Automatic CIC, there are two options for selecting automatic CIC checks to be performed in connection with a Logging or Event Logging measurement. Choosing this set-up displays a screen similar to Fig. 4.16.

1. Set `Before and After` to `On`.

When the Logging or Event Logging measurement starts and ends, an automatic CIC check is done.

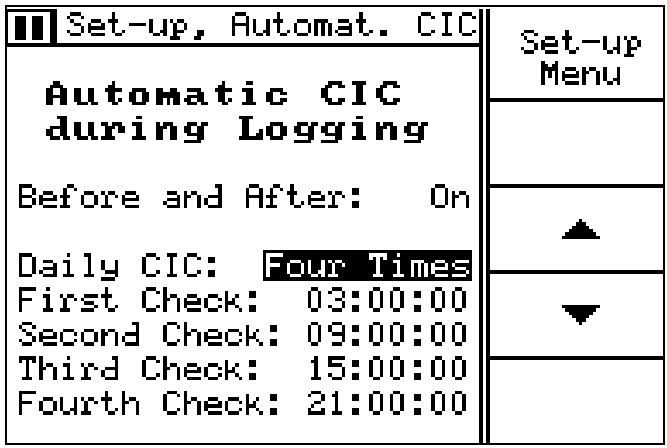

Fig.4.16 Automatic CIC calibrate menu

2. Set `Daily CIC` to `None`, `Once`, `Twice`, `Three Times` or `Four Times`.

   You specify how often the automatic CIC is to be done. Choices range from 1 to 4 times each day.

Set `First Check`, `Second Check`, `Third Check` and `Fourth Check`, depending on the number of daily CIC checks specified above.

Automatic CIC checks are done on a daily basis during a Logging or Event Logging measurement at the specified times according to the values set in the relevant check fields. Automatic CIC checks are always delayed until the end of the current sample.

If a CIC check is scheduled to take place when an event is happening, the CIC is delayed until the next appropriate time. If a collision with an event occurs such that a CIC period is totally missed, the CIC results table indicates this.

4.4.3 Documentation of a Calibration

The result and time of a calibration is stored with measurement data. When you recall data, page 4 of the recalled set-up (see section 5.9) documents the calibration. If an initial calibration has been registered, this too, together with the microphone's serial number, will be documented with the data.

A printout of the recalled set-up will provide hard-copy documentation of these and Initial Calibration details.

Automatic CIC checks are documented in the measurement file to which they belong. These can be read using the `Automatic CIC` screen on the `Measure` menu (see section 5.11).

4.4.4 Checking the Analyzer's Calibration

To run a calibration check, follow the instructions given in section 4.4.2 up to the point where, Fig. 4.10 appears. Check whether there has been any `Deviation from last calibration`, then press the <`Cancel`> soft key.

4.5 Resetting

Before you press the $\overline{0\leftarrow}$ hard key during a measurement you must decide what to do with the data so far collected. There are two possible outcomes if the elapsed time of measurement has exceeded one minute.

- You will be warned that all data up to now will be lost and the analyzer will automatically reset and restart the measurement. If you accept this press the <`OK`> soft key.

  OR

- Press the <`Cancel`> soft key and then press the $\frac{11}{\blacktriangleright}$ hard key to pause the measurement and store via the $\overline{\downarrow}$ hard key (see section 6.2) whatever data have so far been measured. After this you can press the $\overline{0\leftarrow}$ hard key to reset and restart the measurement.

If the elapsed time is under one minute, no warnings will appear and automatic reset/restart will occur without user-dialogue.

4.6 Starting a New Measurement (Manual Control)

4.6.1 Starting, Resetting and Pausing a Measurement

Starting/Resetting

To start a fresh measurement, press the $\overline{0\leftarrow}$ hard key. This ensures that all counters, registers etc. are reset to zero and all previous measurement data are deleted. See also section 4.5 regarding deletion of previous data.

Whenever a measurement is in progress, the symbol ▶ appears in the top left-hand side of the screen in the status line.

Making a Pause or Continuing with a Measurement

To make a pause at any time during a measurement, press the $\frac{\text{II}}{\blacktriangleright}$ hard key. This will stop the elapsed-time clock and suspend the gathering of measurement data.

Whenever a measurement is paused, the symbol ❚❚ will appear in the top left-hand side of the screen in the status line. If you want to continue with the same measurement, press the $\frac{\text{II}}{\blacktriangleright}$ hard key again.

4.6.2 Measuring According to Standards

IEC Standards

If you want to measure according to IEC standards (i.e. free field), make sure that the **S. I. Corr.** is set to `Frontal`, see

section 3.3.3. Simply point the analyzer towards the sound source.

ANSI Standards

If you want to measure according to ANSI standards (i.e. diffuse field), make sure that the **S. I. Corr.** is set to `Random`, see section 3.3.3. If the sound field is diffuse or the sound arrives from random directions, the direction of the analyzer is unimportant. If, however, the sound field is free, measure with the analyzer at an angle of between 70° and 80° to the sound source.

4.7 Timers and Automatic Measurements

4.7.1 Introduction

Automatic control of the analyzer is available via one or more of the software's nine timers. The purpose of a timer is to initiate measurements in the absence of an operator. Basically, a timer will:

- Switch on the analyzer at a preset time and date
- Install a preselected set-up
- Initiate a measurement routine as specified in the set-up
- Switch the analyzer off
- Repeat the above at preset intervals and at a preset number of times

For a timer to work, the analyzer must be in the switched-off state, unless already switched on by a previous timer.

A timer will never interrupt the analyzer if it is already in use manually. If a switch-on time is during the time of any manual use of the analyzer, the timer opportunity is lost.

If the wake-up time is during the time of another timer-initiated measurement, action will be taken immediately after this measurement is completed.

You can control the analyzer during a timer-initiated measurement as long as this does not affect the measurements. If you try to change any parameters affecting the measurement you will be warned of this. If you persist, the analyzer will revert to manual control and timer control cannot be resumed.

During any timer-initiated measurement, the timer symbol replaces either ▶ or ❚❚ in the status line at the top of the display.

4.7.2 Setting Up a Timer

Procedure

1. Start by pressing (repeatedly if necessary) the set-up hard key symbolised by ⇆ until Fig. 4.17 appears.

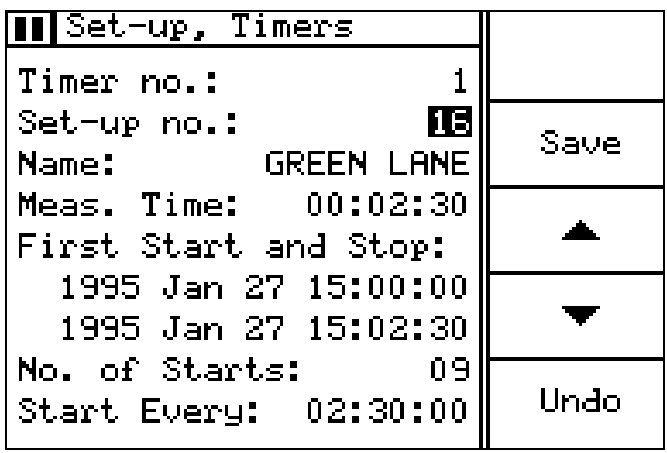

Fig. 4.17 Timers Set-up menu

2. Use the ▲ ▼ ◄ ► hard keys to step through the various fields of the selectable parameters until the one you want to change is highlighted. Then with the < ▲ > and < ▼ > soft keys step through the available settings of that parameter until the one you need is displayed.

   This will also cause the <Save> and <Undo> soft keys to appear. The range of available values for each measurement parameter is given in section 4.7.3.

3. Press the <Save> soft key to confirm your choice, this will also cause the <Save> and <Undo> soft keys to disappear.

4. Repeat steps 2 and 3 until you are satisfied with the setting or value of each parameter. If you wish to undo any one of these, press the <Undo> soft key instead of the <Save> soft key and all settings/values will revert to what they were the last time the <Save> soft key was pressed.

4.7.3 Range of Available Settings for Timers

Fig. 4.17 lists the items and their settings for a particular timer set-up. Each is described in the following.

Timer No.:

Any integer value from 1 to 9. This means you can set up a maximum of nine timers. See section 4.7.5 on using more than one timer simultaneously.

Set-up No.:

Any integer value from 1 to 99. Use this entry to specify the set-up of your choice (see section 6.4.2). The selected set-up specifies how the measurement routine is to be used each time the analyzer is switched on automatically.

To store measurement results automatically, ensure that Func. is not set to Manual. If Func. is set to Meas. Sequence or Automatic, then Action after Meas. should be set to Store. For the selected set-up, see Fig. 3.5.

Only set-ups stored on the disk can be specified. To use the current set-up of the analyzer, you must first make sure it has been stored on the disk (see section 6.4.2).

Name:

Descriptive name which accompanies the selected Set-up No**.** (see section 6.4.2).

Meas. Time:

The duration of the measurement routine which is performed each time the analyzer is switched on automatically and is determined by the selected set-up (see section 3.5.3).

When the selected set-up specifies that a CIC check is to be done before and after the measurement, the total measurement time will be extended by approximately 30 seconds.

First Start

Date and time of starting a measurement for the first time. The field entries for year, month, day, hour, minute and second are user selectable. You can enter up to one month ahead.

When the selected set-up specifies that a CIC check is to be done before and after the measurement, the start of the measurement will be delayed by approximately 15 seconds (BZ 7210 and BZ 7206 only).

First Stop

Date and time of finishing a measurement for the first time. The field entries are fixed automatically by adding Meas**.** Time to First Start.

When the selected set-up specifies that a CIC check is to be done before and after the measurement, the end of the measurement will be delayed by approximately 15 seconds (BZ 7210 and BZ 7206 only).

No. of Starts:

Any integer value from `1` to `99`. This is the total number of times you want to start the measurement.

Start Every:

The time interval between the start of each successive measurement. This interval must not be less than Meas**.** Time.

Example

Fig. 4.18 shows an example which illustrates the actions of the analyzer for a specific routine performed four times and initiated on three separate occasions by a timer. The set-up used here is the same as the example shown in Fig. 3.5, that is

```
Func.: Meas. Sequence
No. of Meas.: 4
Next Action: Reset and Start:
```

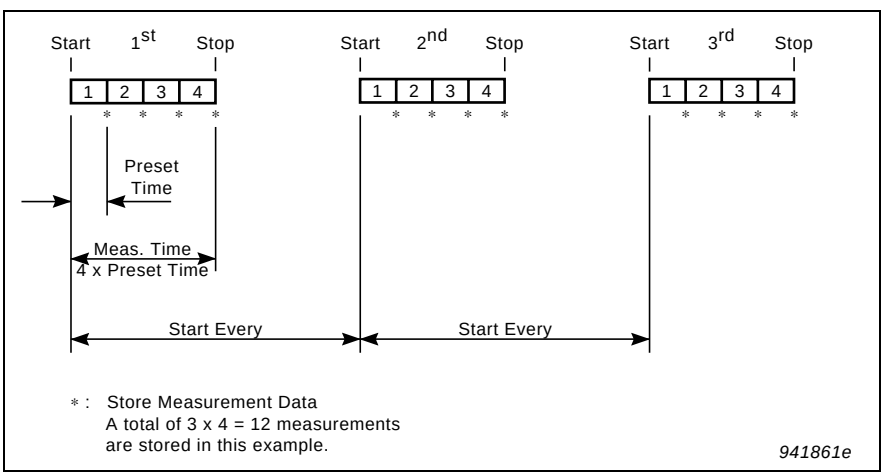

Fig. 4.18 Example of a measurement routine performed four times and initiated three times by a timer. The total number of measurements is 12

Timer actions are separated in time by whatever value is entered in the field next to `Start Every:` in Fig. 4.17.

Fig. 4.18 shows that, for each timer initiation, the analyzer performs and stores the results of the measurement four times. For three timer-initiations, therefore, the total number of stored results is 12, stored in three files.

4.7.4 Steps in Setting Up a Timer-controlled Measurement

The following steps should be followed when you want the analyzer to make measurements automatically under timer control.

1. Set up the measurement parameters (section 3.3).
2. Set up the measurement control parameters (section 3.5).
3. Set up the measurement path (section 6.2).
4. Set up the input parameters (see section 3.4).
5. Store the required measurement set-up (section 6.4).
6. Set up the timers (section 4.7.2).
7. Switch the analyzer off and place it where the measurements are required.

4.7.5 Multi-timer Control

Several timers with different measurement set-ups can be used in shift to activate the analyzer. An good example would be day- and night-time measurements during a weekend each with its own timer set-up menu. Here, day-time measurements with data storage could be performed every hour and night-time measurements with data storage could be performed every 20 minutes.

4.8 Deleting Bad Data from a Measurement

Introduction

Bad data can be removed immediately from a current measurement manually. The analyzer provides a monitoring facility similar to Profile (see section 5.7) combined with a Back Erase facility which allows you to erase up to 15 seconds of the latest data. If there is less than 15 seconds of data then you can erase only as far back as the last pause or the start of measuring; whichever is the more recent.

Note: The Back Erase facility requires that the analyzer be paused, and is only available in the `Manual`, `Automatic` or or `Meas Sequence` functions. The `Logging` and `Event Logging` functions do not have back erase. To edit Logged files that contain bad data, use the marker facility and then edit the data using Evaluator™ Type 7820 PC software.

4.8.1 How to Remove Bad Data

1. Pause the analyzer by pressing the ⏸ hard key.

2. Press the hard key to display one of the menus containing a <Back Erase> soft key, for example like that shown in Fig. 4.19.

3. Press the <Back Erase> soft key to display Fig. 4.20 which is the Back Erase display showing the profile over the last 15 seconds before pause and the <Cursor> soft keys. Press (if necessary) the hard key to reveal the full display.

4. Use the <Cursor> soft keys to position the cursor so that the shaded area of the display (right of the cursor) covers the part of the profile to be deleted.

5. If satisfied, press the <OK> soft key to remove all data measured within the time represented by the shaded

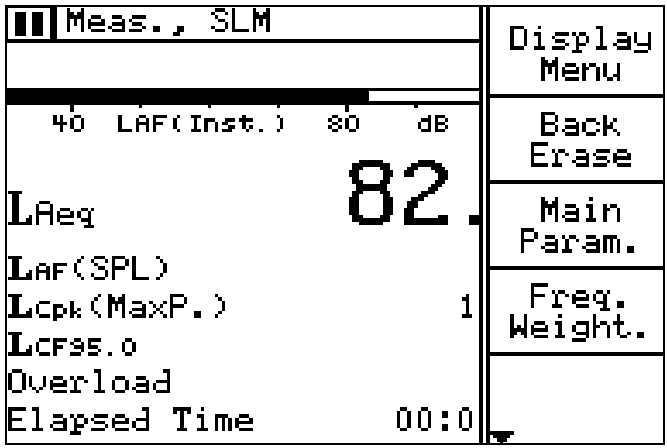

Fig.4.19 SLM measurement menu. Press the <Back Erase> soft key to get Fig. 4.20

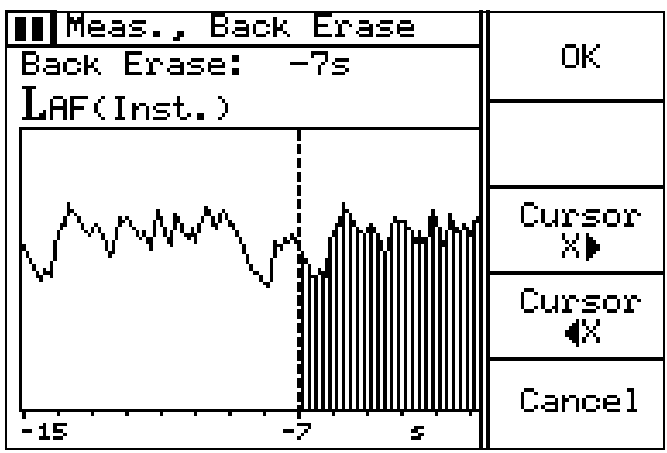

Fig.4.20 Back Erase menu during a pause in a current measurement

area, otherwise press the <Cancel> soft key to do nothing about the shaded data. Either way, the previous display

will return and you can continue with the measurement by pressing the ⏯ hard key.

Chapter 5

Viewing Results

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5.1 Viewing Results

5.1.1 Introduction

The results of a measurement (whether current or recalled) can be viewed in several ways. All current results are viewable in real-time via the Measurement mode.

5.1.2 Scope for Viewing Current Measurements

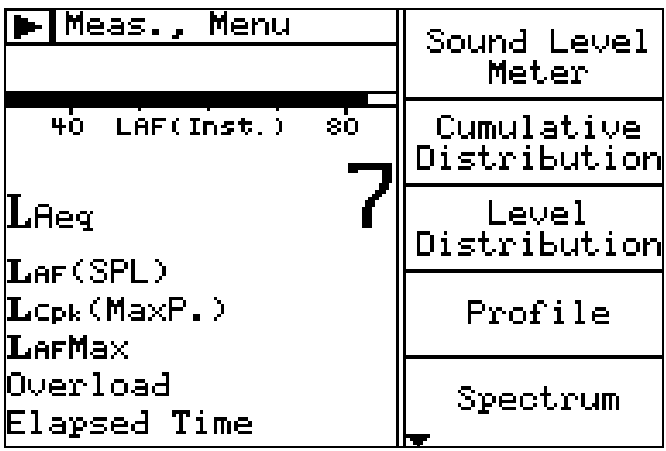

Fig.5.1 Measurement Display menu itemising various ways of viewing current measurements and the CIC results

Fig. 5.1 itemises what is available for current measurements, these are:

- Sound Level Meter (for discrete parameters)
- Cumulative Distribution (for percentile levels)
- Level Distribution (for statistical level distribution)
- Profile (for displaying levels over the last 15 s or 60 s and for setting markers on logged data)

- Spectrum (for octave-band or $^1/_3$-octave band levels)
- List of Automatic CIC results (BZ 7210 and BZ 7206 only)

5.1.3 Scope for Viewing Recalled Measurements

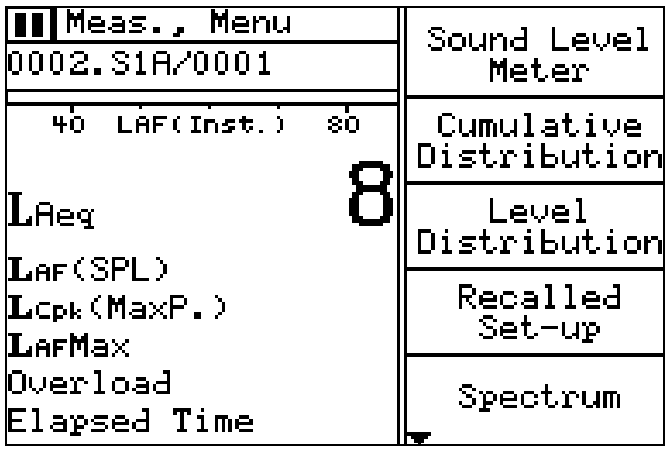

Fig. 5.2 Measurement Display menu itemising various ways of viewing recalled measurements as well as their set-ups

Fig. 5.2 itemises what is available for recalled measurements (see section 6.3), these are:

- Sound Level Meter (for discrete parameters)
- Cumulative Distribution (for percentile levels)
- Level Distribution (for distribution levels)
- Recalled Set-up (for the set-up of a recalled measurement)
- Spectrum (for octave-band or $^1/_3$-octave band levels)
- Automatic CIC (BZ 7210 and BZ 7206 only)

5.2 The Measurement Mode

Press the hard key to get the Measurement mode and, if necessary, press the `<Display Menu>` soft key to get the relevant display, examples are shown in Fig. 5.1 (for current measurements) and Fig. 5.2 (for recalled measurements). The menu column in each example gives access to the different ways of looking at the measurements. See section 3.6 for setting up this display.

In the upper left-hand corner of Fig. 5.1 there is a symbol which is (measurement in progress), (event in progress) or (measurement paused). A pause can arise either automatically (at the end of a measurement) or you can manually enforce one by pressing the hard key.

While there is an overload, the word `Overload` will flash next to the / symbol. To remind you that an overload has occurred during the current measurement, an arrow head ▶ will appear and remain at the end of the quasi-analogue bar. To see this you may have to press the hard key.

Note: You cannot always rely on measurements if an overload occurs. This is especially critical for spectral data.

5.3 Quasi-analogue Display Bar

Except when using the Sound Level Meter display, the quasi-analogue display bar is always shown unzoomed and set up as described in section 3.6.2.

5.4 Viewing Sound Level Meter Parameters

5.4.1 Current Measurements

With Fig. 5.1 on display, press the <Sound Level Meter> soft key to display Fig. 5.3. Use the soft keys as follows:

- <Display Menu>: to return to Fig. 5.1 (Fig. 5.2 for a recalled measurement).

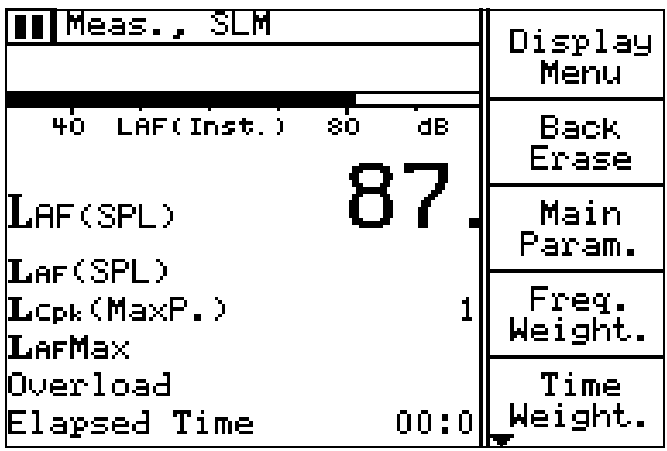

Fig. 5.3 The measurement menu in the sound-level-meter mode

- <Back Erase>: for removing bad data (available only in Manual and Meas. Sequence/Automatic function when the analyzer is paused), see section 4.8.
- <Main. Param.>: to step through the previously-defined set of main parameters (see section 3.6.3) and select one.
- <Freq. Weight.>: to toggle between the A or L/C weighted main parameter. The choice of L or C is determined by the set-up described in section 3.3.2 and Table 3.2.

This soft key is available only when relevant to the selected main parameter.

- <Time Weight.>: to step through the F(ast), S(low) or I(mpulse) weighted main parameter and select one.

  This soft key is available only when relevant to the selected main parameter.

- <Edit Display.>: to create different “looks”.
- <Zoom Bar>: for switching between a zoomed and unzoomed quasi-analogue bar. When switched to zoomed, the zoom range is automatically centred around the currently displayed level in the quasi-analogue bar. To reenter a zoomed range around a changed current level, zoom out and in again.

5.4.2 Recalled Measurements

For a recalled measurement (see section 6.3), there are extra menu pages available with sound level meter parameters. The soft keys with the same names as those described in section 5.4.1 have also the same functions. In addition, there are the following:

- <Current Meas.>: to return to displaying the current measurement.
- <File>: to ▲ increment or ▼ decrement the File # thereby recalling a new data file.
- <Meas. No.>: to ▲ increment or ▼ decrement the measurement number in a recalled measurement sequence or logged measurement.
- <Event No.>: to ▲ increment or ▼ decrement event measurements (BZ 7206 only).
- <Sample No.>: to ▲ increment or ▼ decrement the event sample number in a recalled event (BZ 7206 only).

5.5 Viewing a Cumulative Distribution

5.5.1 Current Measurements

With Fig. 5.1 on display, press the <Cumulative Distribution> soft key to display the cumulative distribution curve. The example in Fig. 5.4 shows the cumulative distribution of a fluctuating broadband noise level.

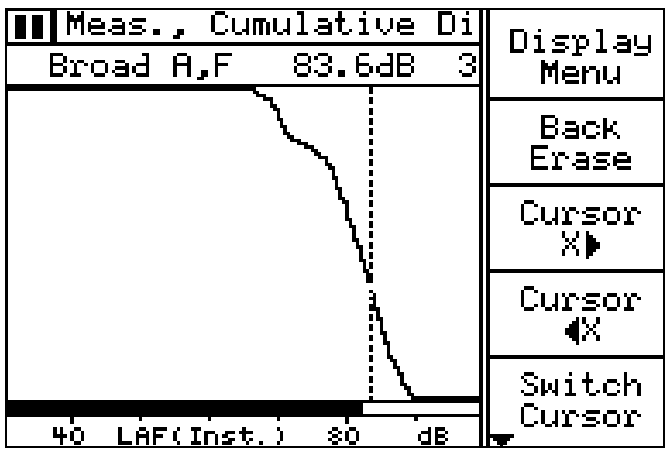

Fig.5.4 Cumulative distribution graph of a current measurement

Use the soft-keys as follows:

- <Display Menu>: to return to Fig. 5.1 (Fig. 5.2 for a recalled measurement).
- <Back Erase>: for removing bad data, see section 4.8.
- <Cursor>: to step/move the cursor. The cursor reading appears in terms of P dB and Q % meaning that P dB was exceeded for Q % of the elapsed time. If Q = 50% and P = 56 dB, then L_{50} = 56 dB (a percentile level).

- <Switch Cursor>: to switch between a horizontal or vertical cursor. A horizontal cursor (Y) moves either ▲ up or ▼ down and a vertical cursor (X) moves either ◄ left or ► right.
- <Band>: to step through and select either a spectrum band or the broadband (BZ 7206 only). **Note:** The frequency and time weightings of these are fixed by the set-up described in section 3.3.3 and Table 3.2.

  (The cursor can also be moved using the ◄ or ► hard keys).

5.5.2 Recalled Measurements

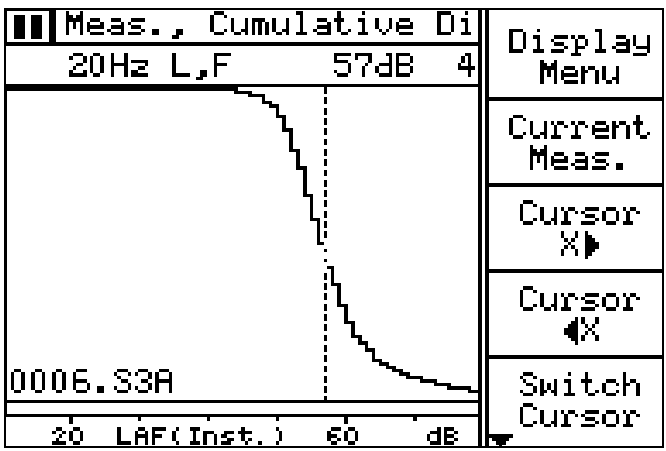

Fig.5.5 Cumulative distribution of a recalled measurement showing the first page of its menu

For a recalled measurement (see section 6.3), there are extra menu pages available with the cumulative distribution. See the example in Fig. 5.5 The soft keys with the same names as those described in section 5.5.1 also have the same functions. In addition, there are the following:

- <Current Meas.>: to return to displaying the current measurement.

- <File>: to ▲ increment or ▼ decrement the File # thereby recalling a new data file.
- <Meas. No.>: to ▲ increment or ▼ decrement the measurement number in a recalled measurement sequence or logged measurement.
- <Event No.>: to ▲ increment or ▼ decrement event measurements (BZ 7206 only).
- <Sample No.>: to ▲ increment or ▼ decrement the event sample number in a recalled event (BZ 7206 only).

5.6 Viewing a Level Distribution

5.6.1 Current Measurements

With Fig. 5.1 on display, press the <Level Distribution> soft key to display the level distribution curve. The examples in Figs. 5.6 and 5.7 show (for a class interval of 1 dB) the level distributions of a fluctuating broadband noise level.

Fig. 5.6 shows the un-zoomed graph and Fig. 5.7 shows the zoomed graph.

Use the soft keys as follows:

- <Display Menu>: to return to Fig. 5.1 (Fig. 5.2 for a recalled measurement).
- <Back Erase>: for removing bad data, see section 4.8.
- <Cursor>: to step/move the cursor either ◄ left or ► right. The cursor reading appears in terms of P1– P2 dB and Q % meaning that for Q % of the elapsed time, the noise levels were within the class interval of P1– P2 dB picked out by the cursor.

  (The cursor can also be moved using the ◄ or ► hard keys).
- <Zoom Graph>: to zoom in and out of the graph. The un-zoomed graph (Fig. 5.6) covers the range 0 – 100 % and

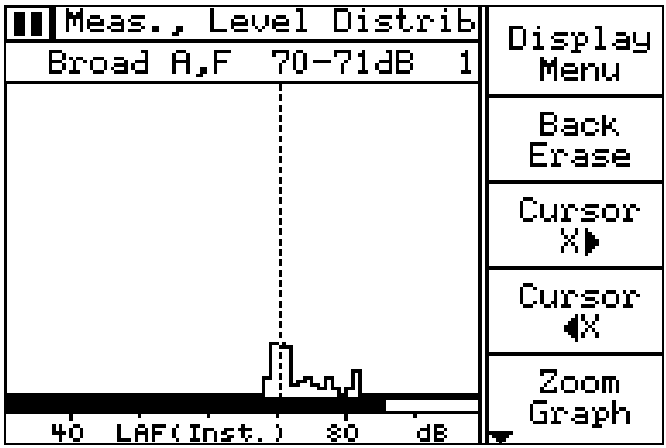

Fig.5.6 Level distribution of a current measurement showing the un-zoomed graph

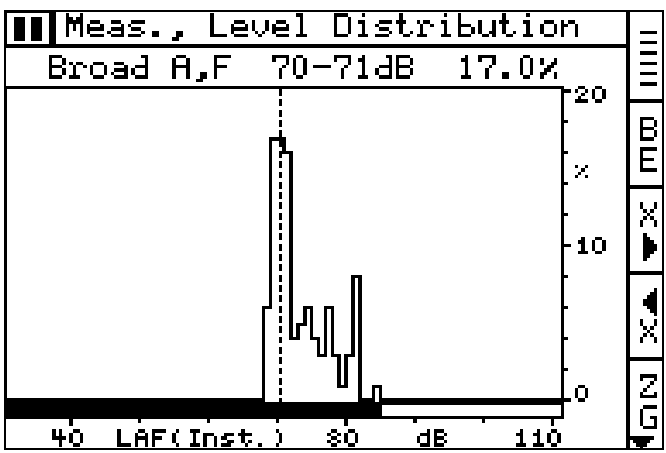

Fig.5.7 Level distribution of a current measurement showing the zoomed graph (menu column minimised to see the full display)

the zoomed graph (Fig. 5.7) concentrates on the actual range of the measured distribution.

- <Band>: to step through and select either a spectrum band or the broadband (BZ 7206 only). Note: the frequency and time weightings of these are fixed by the set-up described in section 3.3.3 and Table 3.2.
- <Class>: to ▲ increase or ▼ decrease the width of the class interval. Possible class intervals are 1 dB, 2 dB, 5 dB, 10 dB and 20 dB.

5.6.2 Recalled Measurements

For a recalled measurement (see section 6.3), there are extra menu pages available with the level distribution. See the example in Fig. 5.9. The soft keys with the same names as those described in section 5.6.1 have also the same functions. In addition, there are the following:

- <Current Meas.>: to return to displaying the current measurement.
- <File>: to ▲ increment or ▼ decrement the File # thereby recalling a new data file.
- <Meas. No.>: to ▲ increment or ▼ decrement the measurement number in a recalled measurement sequence or logged measurement.
- <Event No.>: to ▲ increment or ▼ decrement event measurements (BZ 7206 only).
- <Sample No.>: to ▲ increment or ▼ decrement the event sample number in a recalled event (BZ 7206 only).

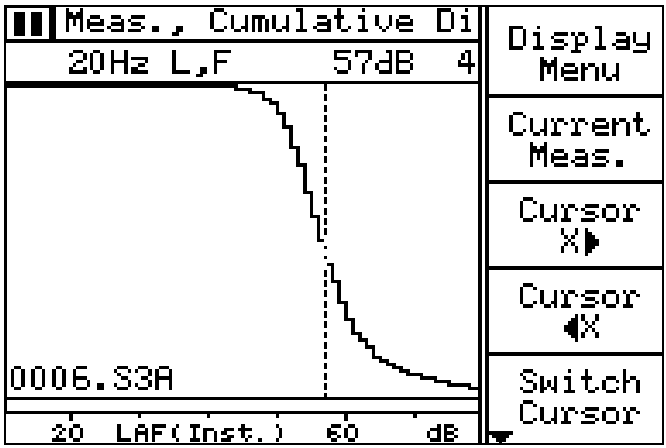

Fig.5.8 Cumulative distribution of a recalled measurement showing the first page of its menu

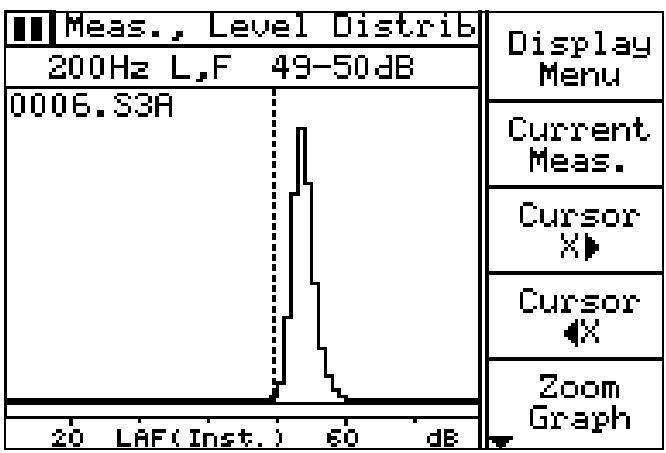

Fig.5.9 Level distribution for a recalled measurement showing the zoomed graph

5.7 Viewing a Profile

5.7.1 Manual, Automatic or Meas. Sequence Functions

This facility applies only to the current measurement. It allows you to monitor visually the variation of the measured parameter L_{AF} (Inst) over the previous 15 seconds. If there is less than 15 seconds of data, the profile will go back only as far as the last pause or start of measuring; whichever is the more recent. **Note:** A profile can only be stored using the BZ 7206 "Log LAF" facility described on pages 3–24 and 3–27.

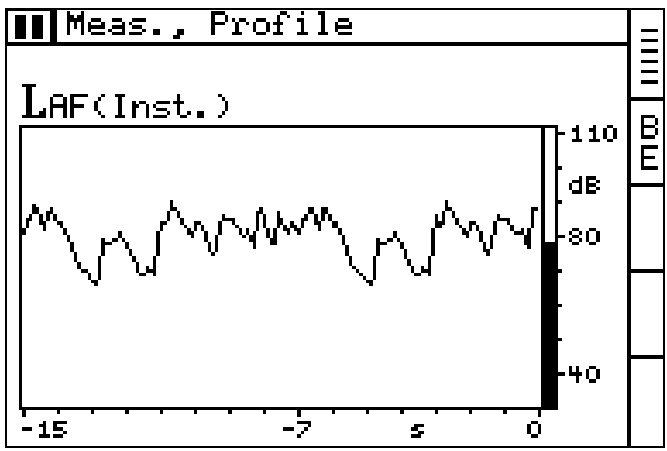

Fig. 5.10 Profile measurement menu showing the variation of L_{AF}(Inst.) over the previous 15 seconds

With Fig. 5.1 on display, press the <Profile> soft key to display a 15-second profile, an example is shown in Fig. 5.10. When measurements are in progress (is displayed), the profile is updated every second.

To see the full display, press the hard key.

Use the two soft keys as follows:

- <Display Menu>: return to Fig. 5.1.
- <Back Erase>: for removing bad data, see section 4.8.

5.7.2 Logging or Event Logging Functions

This facility applies only to the current measurement. It allows you to visually monitor the variation of the measured parameter L_{AF} (Inst) over the previous 60 seconds. **Note:** A profile can only be stored using the BZ 7206 "Log LAF" facility described on pages 3–24 and 3–27.

Markers

This facility applies only to the current measurement. It allows you to monitor the variation of the parameter LAF (Inst.) over the previous 60 seconds and set markers.

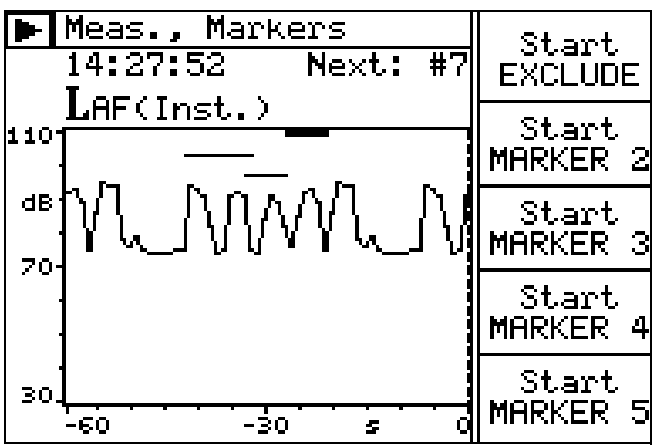

Fig. 5.11 Profile / Markers measurement menu showing the variation of LAF(Inst) over the previous 60 s in Logging Function

Marker Set-up

For Event Logging, the profile displays the trigger levels if Trigger is set to Level.

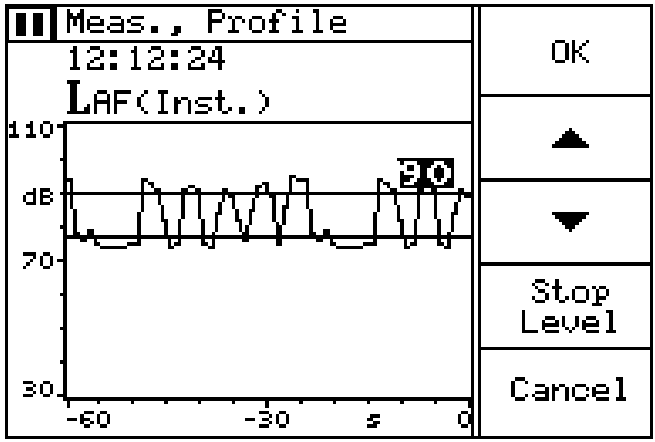

Fig. 5.12 Profile/Markers measurement menu showing adjustment of trigger level in Event Logging Function (BZ 7206 only)

If `Trigger` is set to `Soft Key`, then `Start MARKER 5` changes to `Start Event` (and `Stop Event` when started) (BZ 7206 only).

For Logging and Event Logging, markers and triggers are given unique numbers. When a measurement stops, the markers are no longer visible, but they are stored with the data and can be seen if the data is viewed using Noise Explorer Type 7815, Evaluator Type 7820 or Protector Type 7825.

Each of Markers 2 to 5 can be given a name by highlighting the name in `Set-up/Markers` (see Fig. 5.13) and selecting `Edit Name`. So you can easily relate the type of marker to the type of event marked. (Marker 1 is always set to `EXCLUDE`).

It is possible to set a pre-marker with a value of up to 5 seconds. When you mark an event, you will then see the marker start that number of seconds earlier.

Editing Markers

When you have created a marker, you can move or resize it at any time within the 60 s that is on the screen (BZ 7206 only) or delete it:

1. When one or more markers is displayed, press ◀. This moves the cursor to the last-activated marker.

2. Use ◀ and ▶ until the marker that you want to edit is selected.

3. The menu on the right-hand side of the display changes to allow you to move the start- or end-point of the selected marker to the left or right (BZ 7206 only), or to delete the marker.

4. When you have finished editing the marker(s), press ▶ repeatedly until the Marker menu appears to the right (or wait until all markers have disappeared off the left-hand edge of the display).

Zooming the Y-axis

Use the ▲, ▼ hard keys to zoom or unzoom the y-axis. The y-axis zooms in 10 dB steps between 80 and 30 dB. The full scale of the y-axis is set so that the profile remains in the middle of the screen.

5.8 Control of Sound Recording on a PC

5.8.1 PC Sound Recording

To be sure of what had caused a marked event, you can record sound directly onto your PC's hard drive.

With Evaluator Type 7820 version 4.0, or Noise Explorer Type 7815 version 4.0 or Protector Type 7825 version 4.0, installed on your PC, you can use 2260 Investigator to control sound

recording on the hard disk while making measurements. The only limit to duration is the size of the hard disk.

Sound recording can be tagged to one or more markers. There is a 60 s sound buffer in the PC to permit editing of markers up to 1 minute after the occurrence has taken place (BZ 7206 only). Recordings are time stamped and stored as .wav files. After transferring the measurement data from 2260 to 7815/20/25, the data are automatically merged with the sound recordings. The sound recordings are then marked in the profile display of the 7815/20/25 and can be replayed. You use the cursor position in the profile display to decide which part of the recording you want to hear.

5.8.2 Recorder Set-up

The marker set-up (Fig. 5.13) allows you to set up when recordings are made and for which markers.

PC sound recording can be `Marker Controlled` or `Measurement Controlled`.

For `Marker Controlled` measurements, a recording is started at the same time as the marker if `Recording` is set to `On` for that marker. For `Event Logging` measurements, a recording is started at the same time as the event if `Recording` is set to `On` for events (BZ 7206 only).

If you have selected `Measurement Controlled`, a recording is started every time you start a measurement.

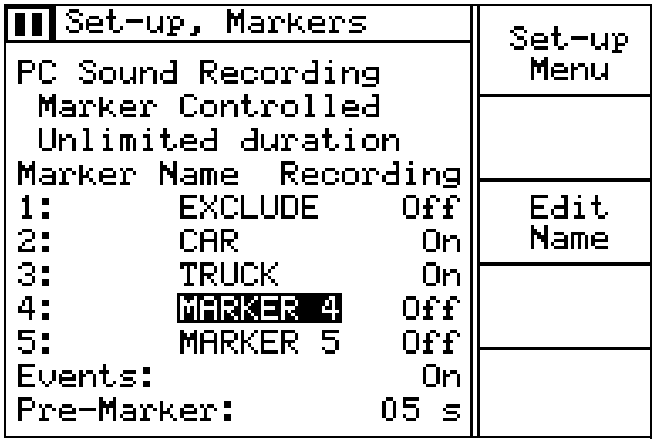

Fig.5.13 An example of the Measurement Set-up screen

Recording can be of unlimited duration (as long as the measurement runs and the sound marker is active) or of a fixed number of seconds from 1 to 60 (even if more is marked).

5.8.3 Connecting to a PC

Sound is recorded on a PC using the sound card in the PC.

Connect the signal for Aux. 1 or Aux. 2 on Type 2260 to the audio input on the PC using Cable AO 0586.

In `Set-up/Output`, select `Input (C/L)` for Aux. 1 or `Input (A)` for Aux. 2, depending on whether you want C/L- or A-weighting of the signal. C-weighting or linear depends on the `Freq. Weight` for broadband measurements in `Set-up/Meas. Param.`

To control the PC, connect Serial Interface Cable AO 1442 between the serial interface port on Type 2260 and the COM port that you want to use on the PC.

1. Start Noise Explorer, Evaluator or Protector on the PC.

2. Select Tools/Sound Recording.
3. Select 2260 as the Sound Level Meter.
4. Press Set-up to select Line-in and Recording Quality.
5. Adjust the signal level if necessary.
6. Press OK.
7. Select the recording path if necessary.
8. Press Start.

The PC software is now ready to record when signalled from the 2260. The Pause and Measuring icons in the upper left-hand corner of the 2260 display change to Pause and Measuring icons with a recorder symbol as long as Type 2260 controls the recording. Type 2260 returns to “normal” mode when the recording session is stopped on the PC.

5.9 Viewing the Set-up of a Recalled Measurement

With Fig. 5.2 on display press the <Recalled Set-up> soft key. This will display one of the six available Measurement Set-up menus, an example is shown in Fig. 5.14.

Use the soft keys as follows:

- <Display Menu>: to return to Fig. 5.2
- <Current Meas.>: to return to displaying the current measurement.
- <Page>: to ▲ increment or ▼ decrement the set up page number.
- <File>: to ▲ increment or ▼ decrement the File # thereby recalling a new data file.

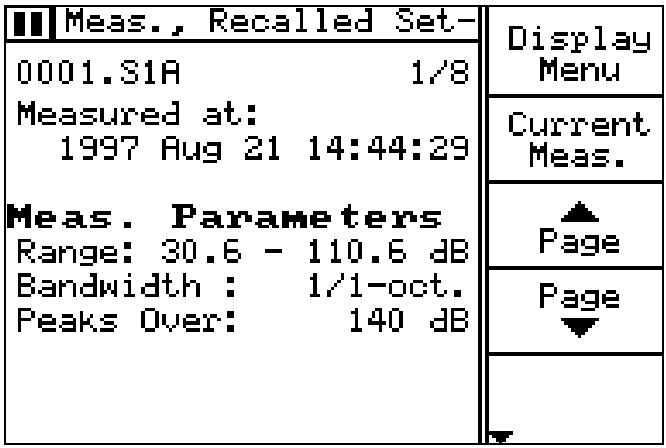

Fig. 5.14 Example of a Display Set-up menu in the Measurement mode

- <Meas. No.>: to ▲ increment or ▼ decrement the measurement number in a recalled measurement sequence or logged measurement.
- <Event No.>: to ▲ increment or ▼ decrement event measurements (BZ 7206 only).
- <Sample No.>: to ▲ increment or ▼ decrement the event sample number in a recalled event (BZ 7206 only).

5.10 Viewing Spectrum Levels

5.10.1 Current Measurements

With Fig. 5.1 on display, press the <Spectrum> soft key to display a spectrum. Fig. 5.15 shows an example of the current octave-band spectrum. Fig. 5.16 shows an example of the current $^1/_3$-octave band spectrum.

To see the full display, press the hard key, for example see Fig. 5.17.

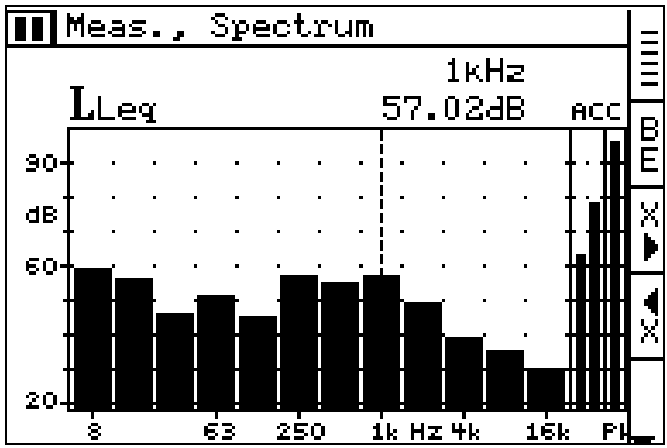

Fig.5.15 Spectrum measurement showing the current octave-band spectrum

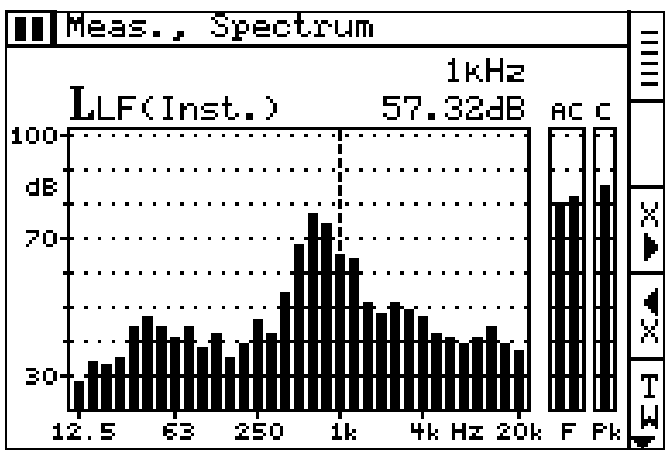

Fig.5.16 Spectrum measurement showing the current $^{1}/_{3}$-octave band spectrum from 12.5 Hz to 20 kHz

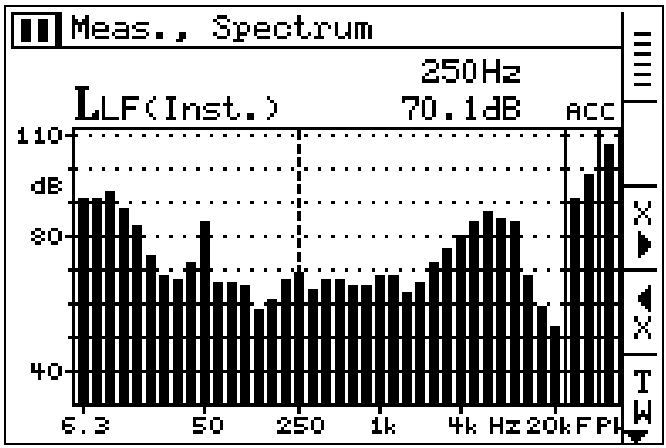

Fig.5.17 $^{1}/_{3}$-octave spectrum from 6.3 Hz to 20 kHz

Spectrum measurements are made and displayed in real-time.

For octave-band measurements, there are 11 or 12 contiguous filters with centre frequencies starting at 16 Hz or 8 Hz and ending at 16 kHz (lower centre frequency depends on the Spectrum Bandwidth setting. See section 3.3.3).

For 1/3-octave band measurements, there are 33 or 36 contiguous filters with centre frequencies starting at 12.5 Hz or 6.3 Hz and ending at 20 kHz (lower centre frequency depends on the Spectrum setting. See section 3.3.3).

There are also three broadband columns on the right of the spectrum. Two are shown together, the third on its own. Time weightings are shown below the columns and frequency weightings (fixed as described in section 3.3.3 and Table 3.2) are shown above them. The time weighting of the bars shown together is user-selectable via the <Time Weight.> soft key. The single bar always shows the Peak value L_{Xpk} (Peak) where X is set up as either C or L as described in section 3.3.3.

Use the soft-keys as follows:

- <Display Menu>: to return to Fig. 5.1 (Fig. 5.2 for a recalled measurement).
- <Back Erase>: for removing bad data (not in logging); see section 4.8.
- <Cursor>: to step and select any displayed band. The centre frequency and the level in a selected octave band are displayed in terms of P Hz and Q dB. In Fig. 5.17 this happens to be 250 Hz and 62.0 dB. When the cursor moves to one of the broad bands, X Hz will, for example, be replaced by L_{AF} (Inst), L_{CF} (Inst) or L_{Xpk} (Peak) as the case may be.

  (The cursor can also be moved using the ◄ or ► hard keys.)
- <Time Weight.>: to step and select a time weighting (F, S or I) for the two broad bands shown together.
- <Meas. Par.>: to step and select a measurement parameter which applies to the spectrum and two broadbands shown together. The example shown in Fig. 5.17 is L_{LF} (Inst). The full list of available measurement parameters is:

  L_{XY} (SPL)

  L_{XY} (Inst)

  L_{Xeq}

  L_{XY} Max

  L_{XYN1} to L_{XYN5} (BZ 7206 only)

  L_{XY} Min

  Where X and Y are frequency and time weightings respectively.

  If L_{XYN1} to L_{XYN5} is selected, only one broad-band column is displayed where there were two together and with the frequency and time weightings fixed as described in section 3.3.2 and Table 3.2
- <Zoom In.>: to adjust the display stepwise to show details around the top (40, 20, 10 or 5 dB) of the spectrum.

- <Zoom Out.>: to return stepwise to the full measurement range (80 dB).
- <Y Axis>: to move the display window ▲ up or ▼ down the zoomed Y-axis to show details of the un-displayed levels of the spectrum.

5.10.2 Recalled Measurements

For a recalled measurement (see section 6.3), there are extra menu pages available with spectral data. See the example in Fig. 5.18. The soft keys with the same names as those de-

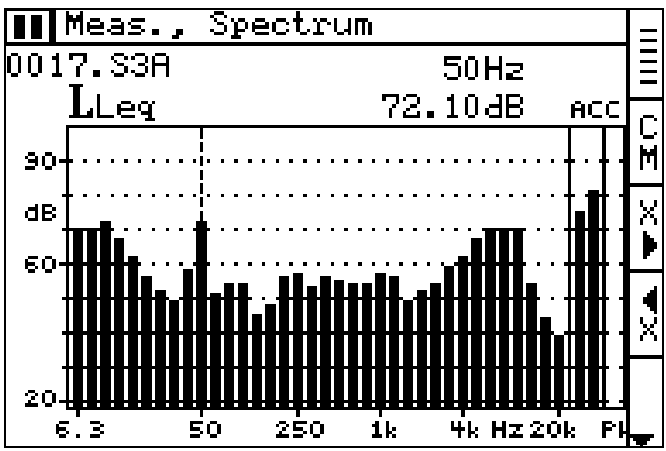

Fig.5.18 Recalled 1/3-octave band measurements showing the un-zoomed graph

scribed in section 5.10.1 have also the same functions. In addition, there are the following:

- <Current Meas.>: to return to displaying the current measurement.
- <File>: to ▲ increment or ▼ decrement the File # thereby recalling a new data file.

- <Meas. No.>: to ▲ increment or ▼ decrement the measurement number in a recalled measurement sequence or logged measurement.
- <Event No.>: to ▲ increment or ▼ decrement event measurements (BZ 7206 only).
- <Sample No.>: to ▲ increment or ▼ decrement the event sample number in a recalled event (BZ 7206 only).

5.11 Viewing CIC Results (BZ 7210 and BZ 7206 only)

With Fig. 5.1 on display, press the <Auto CIC> soft key to display a CIC log, Fig. 5.19.

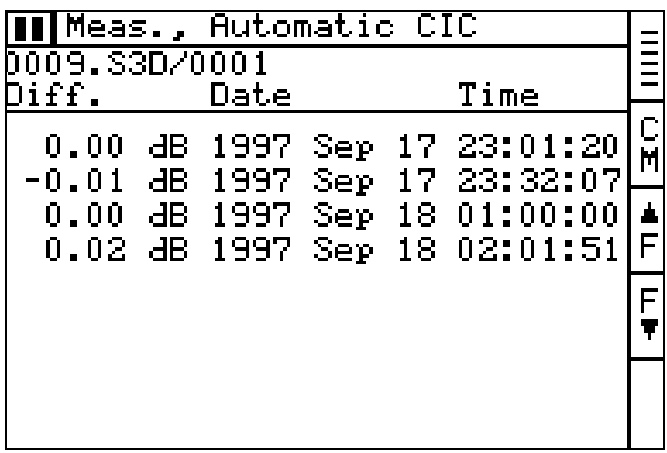

Fig.5.19 Example CIC results log

The first column shows the difference between the measured CIC ratio and the reference CIC ratio obtained during the last calibration.

If no reference CIC is available, the measured CIC ratio is shown directly (and the column heading becomes “Ratio” instead of “Diff.”).

An asterisk (*) behind the CIC value denotes that the background level is too high and has probably affected the CIC value.

If a CIC check has been skipped, three dashes (- - -) are displayed instead of the missing CIC value. A CIC check is skipped when it is postponed until the subsequent CIC check by an event, or by a logging rate that is longer than the time span between the two CIC checks.

The two remaining columns display the time and date for each CIC check.

If there are more than 9 entries in the displayed CIC log, use ▲ or ▼ to scroll up and down through the list.

Chapter 6

Storing and Recalling Data

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6.1 Introduction

This chapter will explain how to store and recall data for both measurement and set-up files. The procedures make use of the analyzer's and hard keys for respectively the Store and Recall facilities.

Measurement data can be stored on either the internal disk or an external memory card. Set-up data are always stored on the internal disk but can be copied to an external memory card as described in the platform's user manual.

In both cases you can choose an existing path or create a new directory.

You can name set-up data using a convenient 15-character name.

In both cases the analyzer must be paused and in the relevant measurement or set-up mode.

6.2 Storing Measurement Data

6.2.1 Introduction

Before you can store any measurement data, the analyzer must be in the measurement mode (which is indicated by `Meas.` in the top left hand corner) and paused . When you store a measurement, you save all measured data current at the time of the (manual or automatic) pause.

You then number the storage file and store it as described in section 6.2.2.

Note: Instantaneous values (see section 2.3.2) and profiles (see section 5.7) are not stored.

6.2.2 How to Store Measurement Data

1. Press the hard key if necessary to make sure the analyzer is in the measurement mode (to tell the analyzer that store concerns measurement data).

2. At this stage you can either wait for an automatic pause or enforce one manually using the hard key.

3. Press the hard key to get the display shown in Fig. 6.1 which is the menu for storing measurement data.

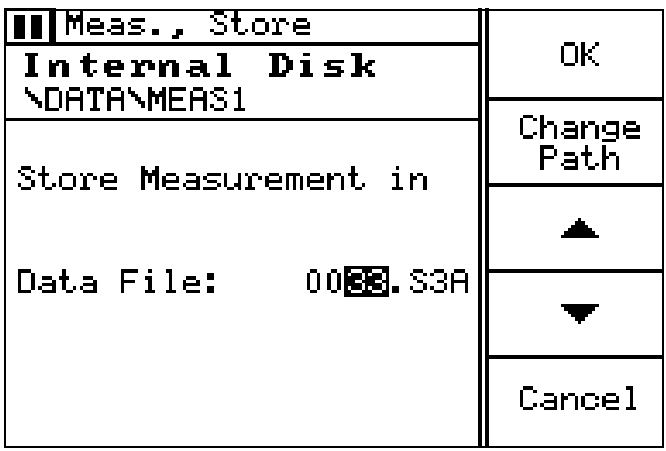

Fig. 6.1 Store menu for storing measurement data in the selected (highlighted) file

4. A measurement file can be stored on either the internal disk or an external memory card on a user-selectable path. Note, the extension of a measurement file indicates its contents, see Table 6.1.

File Extension	File Content
S1A	1/1-octave bands with statistics
S1B	1/1-octave bands without spectrum statistics
S1C	1/1-octave bands without statistics
S1D	1/1-octave band logging or event logging with file contents specified by the set-up
S3A	1/3-octave bands with statistics
S3B	1/3-octave bands without spectrum statistics
S3C	1/3-octave bands without statistics
S3D	1/3-octave band logging or event logging with file contents specified by the set-up

Table 6.1 Indication of the content of a measurement file via its file extension

5. Use the < ▲ > and < ▼ > soft keys to increment/decrement the file number. The default value is the lowest vacant file number available. A warning will appear if you attempt to overwrite an existing file. You can, however, persist with this.

6. If you want to change the path press the <New Path> soft key to get Fig. 6.2 and proceed as described in the platform's user manual to change the path. Use Fig. 6.2 to switch between internal disk or external memory card via the <Change Drive> soft key if you require this.

   If you want to create a new directory for storing the file, press the <Create. Dir.> soft key in Fig. 6.2 to get

Fig. 6.3 and proceed as described in the platform's user manual to create the new directory.

After this Fig. 6.1 will be redisplayed with the new path as current.

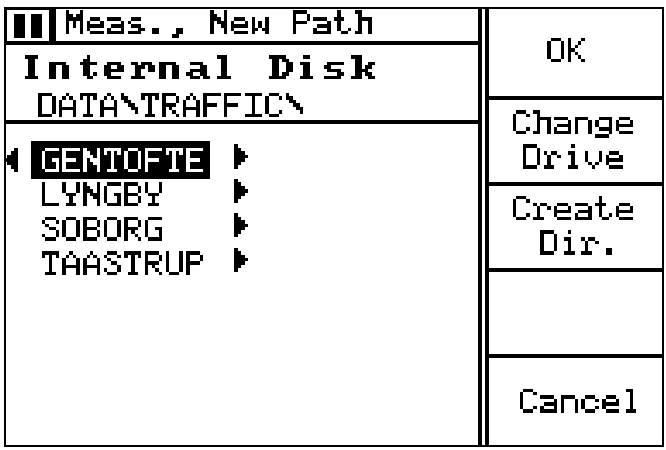

Fig. 6.2 New Path menu for selecting a new path and switching between internal disk and external memory card before storing a measurement file

7. When you are satisfied with the path and file name in Fig. 6.1, press the <OK> soft key to confirm the storage and return to the measurement mode.

See section 6.3 if you want to recall a given measurement-data file.

Refer to the platform's user manual if you want to copy measurement files to and from an external memory card, or to delete them.

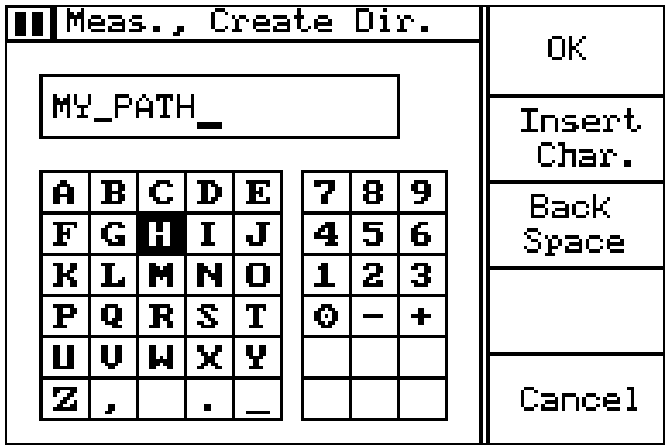

Fig. 6.3 Create Directory menu for creating a new directory before storing a measurement file

6.3 Recalling Measurement Data

6.3.1 Introduction

Before you can recall any measurement data, the analyzer must be in the measurement mode (which is indicated by `Meas.` in the top left-hand corner of the display) and paused. When you recall measurement data, you recall everything that was previously stored, see section 6.2.

6.3.2 How to Recall Measurement Data

1. Press the hard key if necessary to make sure the analyzer is in the measurement mode (to tell the analyzer that a recall concerns measurement data).

2. Make sure the analyzer is paused, if necessary enforce a pause via the hard key.

3. Press the hard key to get the display shown in Fig. 6.4 which is the menu for recalling measurement data.

   Use the <Change Drive> soft key to switch between internal disk or external memory card if you require this.

   Use the ▲ ▼ ◄ ► hard keys to select a file or another path (see platform's user manual).

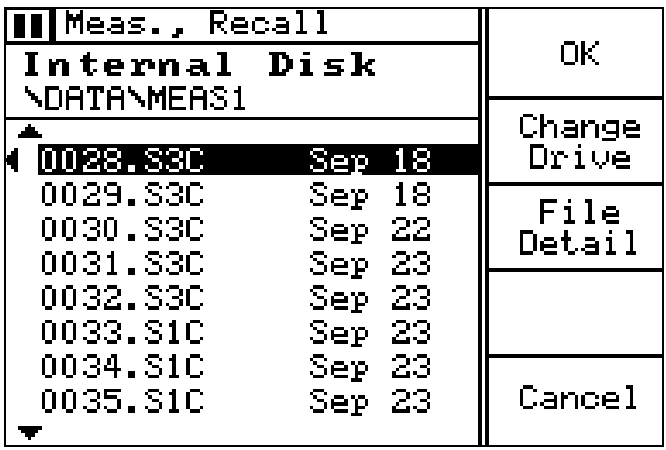

Fig. 6.4 Recall menu for selecting a new path and switching between internal disk and external memory card before recalling a measurement file

4. When you are satisfied with the settings of Fig. 6.4, press the <OK> soft key to confirm the recall and return to the measurement mode where you can examine the recalled data as well as its set-up as described in Chapter 5.

   Otherwise press the <Cancel> soft key and the analyzer will return unchanged to the measurement mode.

See section 6.2 if you want to store measurement data.

Refer to the platform's user manual if you want to copy measurement files to and from an external memory card, or to delete them.

6.4 Storing Set-up Data

6.4.1 Introduction

When you store set-up data, you save the current status of the following:

- Measurement parameters (see section 3.3)
- Measurement control parameters (see section 3.5)
- Measurement path (see Fig. 6.2)
- Input (see section 3.4)
- Output (section 3.7)
- Settings for the following displays:

  Sound level meter (see section 3.6)

  Cumulative distribution (see section 5.5)

  Level distribution (see section 5.6)

  Octave band spectrum (see section 5.10)

  Back erase (see section 4.8)

Make sure you are satisfied with the status of these before proceeding.

6.4.2 How to Store the Current Set-up Data

1. Make sure the analyzer is in the set-up mode, if necessary press the hard key. This tells the analyzer that store concerns set-up data.

2. Press the hard key to get a display such as that shown in Fig. 6.5 which is the menu for storing and nam-

ing the current set-up data. Note all set-up files have the extension .STP and are stored on the internal disk on the path:

SET-UP\BZ7210\	for the BZ 7210 software,
SET-UP\BZ7219\	for the BZ 7219 software or
SET-UP\BZ7206\	for the BZ 7206 software.

Fig. 6.5. shows an example for the BZ 7210 software. When Fig. 6.5 first appears, the suggested file number is the last one recalled because in most cases set-ups will be recalled, modified and restored.

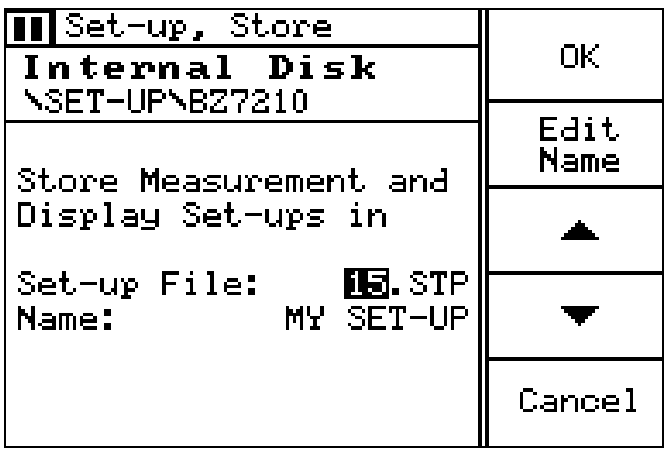

Fig. 6.5 Store menu for storing the current set-up in the selected (highlighted) file with the given Name

3. Use the < ▲ > and < ▼ > soft keys to increment/decrement the file number, range 1 to 99. A warning will appear if you attempt to overwrite an existing file. You can, however, persist with this.

4. If you want to edit the Name of the file, press the <Edit Name> soft key to get Fig. 6.6 and proceed as described in section 6.4.3. After this Fig. 6.5 will be redisplayed with the new Name.

5. When you are satisfied with the file name and `Name` in Fig. 6.5, press the <OK> soft key to confirm the storage and return to the set-up mode.

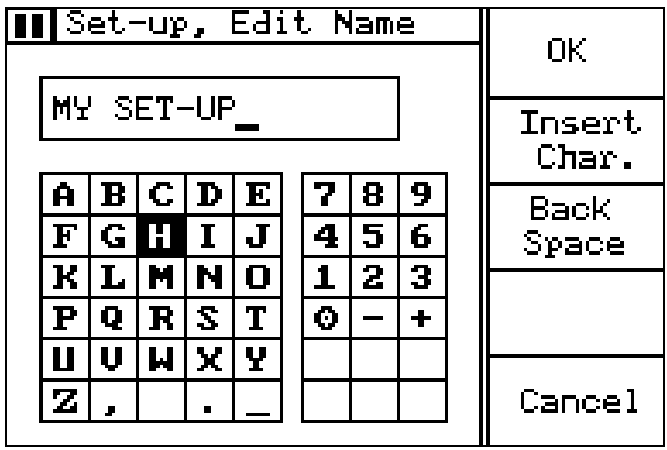

Fig. 6.6 Edit Name menu for editing the name before storing a set-up data file

See section 6.5 if you want to recall a given set-up file.

Refer to the platform's user manual if you want to copy set-up files to and from an external memory card, or to delete them.

6.4.3 Adding a Name to a Set-up Data File

Introduction

Set-up data files are stored in files with a numeric filename and a `.STP` extension (for example, `24.STP`). In addition, you can give the file a name (up to 15 characters long) for easier identification using the analyzer's text editor.

Procedure

1. With the Store menu on the display (see section 6.4.2 steps 1 and 2), select the set-up data file whose name you want to edit.

2. Press the <Edit Name> soft key.

   The Edit Name menu appears showing the current name for the selected set-up data file (see Fig. 6.6).

   The menu consists of a text box containing:

   - The current name and a text cursor (_).
   - A character set and a cursor (highlighting the current character).

3. Press the ▲ ▼ ◄ ► hard keys to move the character set cursor to the character you want to insert.

4. Press the <Insert Char.> soft key to insert the selected character at the current position of the text cursor.

5. Press the <Back Space> soft key to delete the character at the current position of the text cursor and move the text cursor one space to the left.

6. With the desired name in the box, press the <OK> soft key to create the name and return to the Store menu.

7. If, however, you want to cancel storing a set-up with this name, press the <Cancel> soft key instead of the <OK> soft key at any point in step 6.

6.5 Recalling Set-up Data

6.5.1 Introduction

Before you can recall a set-up, the analyzer must be in the set-up mode (which is indicated by `Set-up` in the top left-hand corner of the display) and paused.

When you recall a set-up, you re-install the set-up and its status which is stored in the given set-up file. See also section 6.4.1.

Note: Recalling another set-up during a measurement pause will automatically reset the analyzer. This means that data so far measured will be deleted and overwritten by new data measured with the recalled the set-up.

You will be warned by a pop-up display which requires either confirmation (press the `<OK>` soft key) or cancellation (press the `<Cancel>` soft key) of the intended set-up change. There are two exceptions when no warning is given and parameter changes take place immediately, these are:

- When the data so far measured have been stored (see section 6.2).
- When the measurements have been running for less than one minute.

6.5.2 How to Recall a Set-up

1. Make sure the analyzer is in the set-up mode, if necessary press the hard key. This tells the analyzer that recall concerns set-up data.

2. Press the hard key to get the display shown in Fig. 6.7 which is the menu for recalling set-up files.

3. Use the ▲ and ▼ hard keys to select (highlight) the file of your choice.

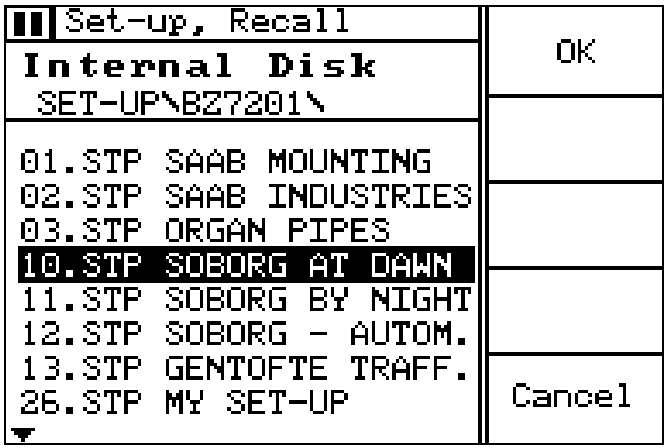

Fig. 6.7 Recall menu for recalling a selected (highlighted) set-up file

4. When you are satisfied, press the <OK> soft key and the analyzer will return to its set-up mode with the chosen set-up installed.

   Otherwise press the <Cancel> soft key and the analyzer will return unchanged to the set-up mode.

See section 6.4 if you want to store a given set-up.

Refer to the platform's user manual if you want to copy set-up files to and from an external memory card, or to delete them.

Chapter 7

Printing and Exporting Data

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7.1 Introduction

This chapter will describe the various outputs available for printing and exporting data using the hard key.

The Print/Output set-up together with what is currently on display decides the content of the analyzer's output. See also the platform's instruction manual.

7.2 General Procedure

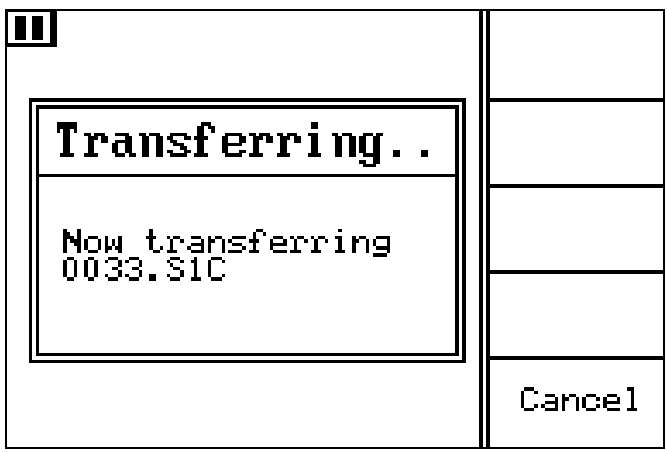

Fig. 7.1 Example of a message while printing is taking place

The general procedure for sending data to an external device comprises the following three steps:

1. Connect the analyzer to the external device and set it up as described in the platform's user manual.

2. Select the appropriate display (see Table 7.1). Not necessary for output to a data file (see section 7.4.3).

3. Press the hard key.

Fig. 7.1 shows an example of a message which appears on the screen while printing takes place. If you want to cancel during printing, press the <Cancel> soft key.

Errors

If the printer does not print out or the data is not transferred to the computer, check:

- The output set-up of the analyzer and ensure that the analyzer's baud rate and handshake (see the platform's user manual) are the same as the printer's or computer's. Switch the computer or printer on again (some printers only check the baud rate while switching on).
- The interface cable between the analyzer and the printer or computer.
- Which port is used on the computer.

If none of these steps work, consult your local Brüel & Kjær service representative.

7.3 Output to a Printer

7.3.1 Introduction

See also section 7.2 which describes the general procedure for sending data to an external device.

Table 7.1 shows the relationship between what is currently on display and what is printed out. Use it to select the display which gives the required printed output.

When Format in the Print/Output Set-up Menu is set to Table, Graph or Table + Graph, or when Type is set to Spreadsheet, the output depends on the current display. Table 7.1 tells you what the output will be for various current displays.

See section 7.3.2 for a description of the contents of the printed measurement data.

Current Display	Printed Output
Sound Level Meter	Overall results
Level Distribution	Level distribution
Cumulative Distribution	Cumulative distribution
Spectrum	Spectrum
Automatic CIC (BZ 7210 or BZ 7206 only)	Automatic CIC
Set-ups	Set-up
Anything Else	No Print – error message

Table 7.1 Printed output for various current displays where Format is set to Table, Table+Graph, or when Type is set to Spreadsheet

7.3.2 Contents of Measured Data

The contents of the printed measurement data (the top four items listed in Table 7.1) are described in Table 7.2.

7.3.3 Screen Dump

When `Format` in the Print/Output Set-up Menu is set to `Screen Dump`, the output is a bit map of the current display.

Output	Content of Printed Output
Overall Results	All broadband and overall discrete parameters (except instantaneous values).
Level Distribution	Level distribution either as graph, table or both. Class width as selected on the screen. Statement of whether broadband, octave-band or 1/3-octave band.
Cumulative Distribution	Cumulative distribution either as graph, table or both. The class width is as selected on the screen for level distribution. Statement of whether broadband, octave-band or 1/3-octave band.
Spectrum	Spectrum as graph, table or both.
Automatic CIC	List of Automatic CIC measurements as a table (BZ 7210 and BZ 7206 only)

Table 7.2 Content of the various outputs to a printer. Graph output is possible with the B&K 2318 printer only. For other printers, use the `Screen Dump` option to print graphical data

7.4 Output to a PC

7.4.1 Introduction

See also section 7.2 which describes the general procedure for sending data to an external device.

There are two output facilities for transferring measurement data to a PC. The first is for a spreadsheet and the second is for a data file.

7.4.2 Spreadsheet

When `Type` in the Print/Output Set-up Menu is set to `Spreadsheet`, the output is the same as for `Type` set to one of the printers but with the following exceptions:

- The output is formatted for spreadsheets and consists only of tabulated ASCII characters. There are no graphs.
- For cumulative and level distributions:

  The class width is always 1 dB.

  The output is the data for all octave-bands or 1/3- octave bands as well as the broad band.

7.4.3 Data File

Note, the output to a data file requires that data have been recalled while one of the five measurement displays (Sound Level Meter, Cumulative Distribution, Level Distribution, Recalled Set-up or Spectrum) is currently on the screen.

When `Type` in the Print/Output Set-up Menu is set to `Data File`, the output is raw measurement data in binary form from a measurement file (recalled as described in section 6.3) for further post-processing in a computer.

7.4.4 PC Software from Brüel & Kjær

Use one of Brüel & Kjær's Windows®-based software packages for post-processing and reporting (Noise Explorer Type 7815 for data management and reporting, Evaluator Type 7820 for community noise calculations or Protector Type 7825 for calculating personal noise exposure). When using one of these software packages, no special analyzer settings are required other than the Baud Rate in the `Set-up, PC Commun.` as the Brüel & Kjær PC software has control over the analyzer.

Chapter 8

Specifications for BZ 7210/BZ 7219 and BZ 7206

The specifications given in this chapter cover all three modules BZ 7206, BZ 7210 and BZ 7219 unless otherwise stated.

8.1 Specifications

Specifications are given for Type 2260 fitted with Prepolarized Free-field $^1/_2$″ Microphone Type 4189 and Input Stage ZC 0026.

Reference Conditions for Acoustic Calibration:

Type of Sound Field: Free
Reference Direction of Sound Incidence: Frontal, perpendicular to microphone diaphragm
Reference Sound Pressure Level: 94 dB
Reference Frequency: 1 kHz
Reference Temperature: +20°C (+68°F)
Reference Measuring Range: 30 – 110 dB

Standards:

Conforms with the following:
IEC 60651 (1979) plus Amendment 1 (1993–02) and Amendment 2 (2000–10) Type 1
IEC 60804 (2000–10) Type 1
IEC 61672–1, Draft (2001–03) Class 1
IEC 61260 (1995–07) Octave Bands and 1/3-octave Bands plus Amendment 1 (2001–09) Class 0
ANSI S1.4–1983 (R 1997) plus ANSI S1.4A–1985 Amendment Type 1
ANSI S1.43–1997 Type 1
ANSI S1.11–1986 (R 1993) Octave Bands and 1/3-octave Bands, Order 3, Type 0–C, Optional Range
DIN 45657 (1997–07)

The effect of the analyzer's casing on the frequency response is shown in Fig. 8.1.
The frequency and directional responses of the analyzer are shown in Figs. 8.2, 8.3 and 8.4

Microphone*:

Prepolarized Free-field $^1/_2$″ Microphone Type 4189
Type: Prepolarized condenser
Nominal sensitivity: –26 dB ±1.5 dB re. 1 V/Pa
Capacitance: 14 pF (at 250 Hz)

Input Stage*:

ZC 0026
Input Impedance: 10 GΩ||<1 pF
Extension Cables: Up to 100 m in length can be added between the input stage and the Type 2260 without affecting measurements

Measuring Range:

Total Range: At 1 kHz, the difference between the nominal upper boundary level (with attenuator ZF 0023) on the least sensitive level range, and the lowest sound pressure level measurable (without attenuator ZF 0023) on the most sensitive level range with a noise margin of 7 dB. Inherent noise is the combination of the electrical noise and the thermal noise from the microphone at 20°C.
A-weighted: 27 dB – 150 dB
C-weighted: 29 dB – 150 dB
Lin (5 Hz – 20 kHz): 35 dB – 150 dB
Lin (3 Hz – 20 kHz): 40 dB – 150 dB

* Not supplied with software but included with the Modular Precision Sound Level Analyzer Type 2260

Primary Indicator Range

For the individual level ranges when using Microphone Type 4189 of nominal sensitivity:

Primary Indicator Range					
Range (dB)	Upper limit (dB)	Lower limit			
		A-weighted (dB)	C-weighted (dB)	Lin (5 Hz – 20 kHz) (dB)	Lin (3 Hz – 20 kHz) (dB)
130	113	50	50	50	50
120	103	40	40	40	43
110	93	30	32	38	43
100	83	30	32	38	43
90	73	30	32	38	43
80	63	30	32	38	43

For the individual level ranges when using Microphone Type 4189 of nominal sensitivity and attenuator ZF 0023:

Primary Indicator Range					
Range (dB)	Upper limit (dB)	Lower limit			
		A-weighted (dB)	C-weighted (dB)	Lin (5 Hz – 20 kHz) (dB)	Lin (3 Hz – 20 kHz) (dB)
150	133	70	70	70	70
140	123	60	60	60	63
130	113	50	50	57	63
120	103	47	50	57	63
110	93	47	50	57	63
100	83	47	50	57	63

Indicator Range

The upper limits of the indicator ranges are equivalent to level ranges.

The lower limits of the indicator ranges are equivalent to the lower limits of the Primary Indicator Ranges.

Linearity Range:

In accordance with IEC 60804 the Linearity Ranges are the differences between the upper limit and the lower limit in the following tables.

For the individual level ranges when using Microphone Type 4189 of nominal sensitivity:

	Linearity Range				
Range (dB)	Upper limit (dB)	Lower limit			
		A-weighted (dB)	C-weighted (dB)	Lin (5 Hz – 20 kHz) (dB)	Lin (3 Hz – 20 kHz) (dB)
130	129	50	50	50	50
120	119	40	40	40	40
110	109	30	30	35	40
100	99	27	29	35	40
90	89	27	29	35	40
80	79	27	29	35	40

For the individual level ranges when using Microphone Type 4189 of nominal sensitivity and attenuator ZF 0023:

Linearity Range					
Range (dB)	Upper limit (dB)	Lower limit			
		A-weighted (dB)	C-weighted (dB)	Lin (5 Hz – 20 kHz) (dB)	Lin (3 Hz – 20 kHz) (dB)
150	149	70	70	70	70
140	139	60	60	60	60
130	129	50	50	54	60
120	119	44	47	54	60
110	109	44	47	54	60
100	99	44	47	54	60

Pulse Range:

In accordance with IEC 60804

The upper limits of the pulse ranges are equivalent to the upper limits of the Linearity Ranges plus 3 dB

The lower limits of the pulse ranges are equivalent to the lower limits of the Linearity Ranges

The pulse ranges are the differences between the upper limits and the lower limits

Inherent Noise Level:

(Inherent noise is the combination of the electrical noise and the thermal noise from the microphone at 20°C.) Typical values using Microphone Type 4189 with a nominal sensitivity are given in Fig. 8.5 and Fig. 8.6. The typical broadband values are:

Weighting	Electrical Noise (2260)	Thermal Noise (4189)	Combined Noise
"A"	12.3 dB	14.6 dB	16.6 dB
"C"	14.0 dB	15.3 dB	17.7 dB
Lin. 5 Hz–20 kHz	19.2 dB	15.3 dB	20.7 dB
Lin. 3 Hz–20 kHz	26.4 dB	15.3 dB	26.7 dB

Frequency Weighting:

Fig. 8.7 shows the curves for the frequency weightings A, C and Lin. They do not include the response of the microphone

Tone-burst Response:

Fig. 8.8 shows the response to 4 kHz tone bursts of various durations

Resolution:

Discrete Parameters: 0.1 dB
Broadband Statistics: 0.2 dB
Octave and $^1/_3$-octave band Statistics: 1 dB (BZ 7206 only)

Octave and $^1/_3$-octave Band Filters:

Conform to IEC 61260 (1995–07) Octave Bands and 1/3-octave Bands Class 0 plus Amendment 1 (2001–09) and ANSI S1.11–1986 (R 1993) Octave Bands and 1/3-octave Bands, Order 3, Type 0-C, Optional Range

Octave Band Centre Frequencies
Nominal: 8 Hz, 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 k Hz, 2 kHz, 4 kHz, 8 kHz, 16 kHz*
Exact: 7.81 Hz, 15.63 kHz, 31.25 Hz, 62.5 Hz, 125 Hz, 250 Hz, 500 Hz, 1 k Hz, 2 kHz, 4 kHz, 8 kHz, 16 kHz
Real-time Frequency Range: 8 Hz to 16 kHz centre frequencies. Fig. 8.9 and Fig. 8.10 show the curves for octave-band filters

1/3-Octave Band Centre Frequencies
Nominal: 6.3 Hz, 8 Hz, 10 Hz, 12.5 Hz, 16 Hz, 20 Hz, 25 Hz, 31.5 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 k Hz, 1.25 k Hz, 1.6 k Hz, 2 kHz, 2.5 k Hz, 3.15 k Hz, 4 kHz, 5 k Hz, 6.3 k Hz, 8 kHz, 10 k Hz, 12.5 k Hz, 16 kHz*, 20 kHz*
Exact: 6.20 Hz, 7.81 Hz, 9.84 Hz, 12.40 Hz, 15.63 Hz, 19.69 Hz, 24.80 Hz, 31.25 Hz, 39.37 Hz, 49.61 Hz, 62.50 Hz, 78.75 Hz, 99.21 Hz, 125 Hz, 157.49 Hz, 198.43 Hz, 250 Hz, 314.98 Hz, 396.85 Hz, 500 Hz, 629.96 Hz, 793.70 Hz, 1 k Hz, 1.2599 k Hz, 1.5874 k Hz, 2 kHz, 2.5198 k Hz, 3.1748 k Hz, 4 kHz, 5.0397 k Hz, 6.3496 k Hz, 8 kHz, 10.079 k Hz, 12.699 k Hz, 16 kHz, 20.179 kHz
Real-time Frequency Range: 6.3 Hz to 20 kHz, centre frequencies. Fig. 8.11 and Fig. 8.12 show the curves for $^1/_3$-octave band filters
Analytical Filter Design: Optimised Z-transformation of analogue Butterworth filters
Octave-based down sampling from 48 kHz
Reference Attenuation: 0 dB

Linear Operating Range: For the individual level ranges measured through AC Input:

Range (dB)	Upper limit (dB)	Lower limit 1/1-octave (dB)	Upper limit 1/3-octave (dB)
130	130	50	50
120	120	40	40
110	110	30	30
100	100	26	22
90	90	26	22
80	80	26	22

* These filters do not fulfil the requirements of paragraph 7.2.3 in the ANSI S1.11–1986 standards. The paragraph states at which frequency the anti-alias filter cut-off should be set. For sound level measurement as performed by BZ 7206 this has no practical significance.

Measurement Range:
1/1-octave: 26 dB to 130 dB
1/3-octave: 22 dB to 130 dB

Detectors:

The analyzer contains several detectors working in parallel on every measurement:
Lin-weighted peak: Conforms with IEC60651
Onset Time: <100 µs
C-weighted Peak: The peak detectors give the following responses to a single-cycle tone burst compared with the theoretical value based on the RMS level of a continuous tone with the same amplitude

Frequency	Peak minus Continuous	Tolerance
31.5 Hz	2.5 dB	±1.0 dB
500 Hz	3.5 dB	±0.5 dB
8 kHz	3.4 dB	±1.0 dB

A-weighted: Broadband detector channel with three exponential time weightings (Fast, Slow, Impulse), one linear averaging detector and one peak detector
C- or L-weighted (switchable): Broadband detector channel with three exponential time weightings (Fast, Slow, Impulse), one linear averaging detector and one peak detector
Octave-band Filters (12) or $^1/_3$-octave band filters (36): Pre-weighted either A-, C- or L-, each with a detector channel containing one linear averaging detector and one exponential averaging detector switchable between Fast or Slow
Octave Time Constant: At low centre frequencies, that is below 63 Hz, the B × T product for 1/1-octave bands becomes too small to give statistically reliable measurements. To overcome this, the Fast time constant (125 ms) is replaced by progressively longer time constants with decreasing centre frequencies (and corresponding bandwidths). The table below shows the time constants for the full range of 1/1-octave bands

For a white Gaussian signal and for centre frequencies from 8 Hz to 63 Hz, these time constants give a relative standard deviation of approximately 1.5 dB

Centre Freq. (Hz)	Time constant (ms)	Averaging time (ms)
63 and above	125 (Fast)	250
31.5	250	500
16	500	1000
8	1000	2000

1/3-octave Time Constant: At low centre frequencies, that is below 100 Hz, the B × T product for 1/3-octave bands becomes too small to give statistically reliable measurements. To overcome this, the Fast time constant (125 ms) is replaced by progressively longer time constants with decreasing centre frequencies (and corresponding bandwidths). The table below shows the time constants for the full range of 1/3-octave bands

Centre Freq. (Hz)	Time constant (ms)	Averaging time (ms)
100 and above	125 (Fast)	250
80, 63, 50	250	500
40, 31.5, 25	500	1000
20, 16, 12.5	1000	2000
10, 8, 6.3	2000	4000

For a white Gaussian signal and for centre frequencies from 6.3 Hz to 160 Hz, these time constants give a relative standard deviation of approximately 2 dB

Overload Detector: Monitors the overload outputs of all the frequency weighted channels

Correction Filters:

Sound Incidence: Built-in filters for correction of frontal/random sound incidence

Windscreen: None, Protective Cover, 65 mm and 90 mm diameter windscreens. See Fig. 8.14 to Fig. 8.16

Measurements:

V = frequency weightings C or L
X = frequency weightings A, C or L
Y = time weightings S, F
N = a number

Available for Display and Storage (Broadband):

Start Date	Start Time	
Stop Date	Stop Time	
Measurement No.		
Elapsed Time	No. of Pauses	Overload %
Underrange %	$L_{Apk(MaxP)}$	$L_{Vpk(MaxP)}$
# Peaks A>L	# Peaks V>L	$L_{AE(ASEL)}$
L_{Aeq}	L_{Veq}	L_{AIm}
L_{VIm}	L_{Veq}-L_{Aeq}	L_{AIm}-L_{Aeq}
L_{ASTm3}	L_{AFTm3}	L_{AITm3}
L_{VSTm3}	L_{VFTm3}	L_{VITm3}
L_{ASTm5}	L_{AFTm5}	L_{AITm5}
L_{VSTm5}	L_{VFTm5}	L_{VITm5}
L_{ASMax}	L_{AFMax}	L_{AIMax}
L_{ASMin}	L_{AFMin}	L_{AIMin}
L_{VSMax}	L_{VFMax}	L_{VIMax}
L_{VSMin}	L_{VFMin}	L_{VIMin}
L_{XYN1}	L_{XYN2}	L_{XYN3}
L_{XYN4}	L_{XYN5}	$L_{AEP,d}$
Level Distribution		Event No.*
Cumulative Distribution		Ev. Samp.No.*

Available for Display and Storage (Octave or 1/3-octave band):

L_{Xeq}	L_{XYMax}	L_{XYMin}
L_{XYN1}*	L_{XYN2}*	L_{XYN3}*
L_{XYN4}*	L_{XYN5}*	
Level Distribution*		
Cumulative Distribution*		

* BZ 7206 only

Available only for Display as Numbers or Bar graphs (Broadband):

$L_{AS(SPL)}$	$L_{AF(SPL)}$	$L_{AI(SPL)}$
$L_{VS(SPL)}$	$L_{VF(SPL)}$	$L_{VI(SPL)}$
$L_{AS(Inst)}$	$L_{AF(Inst)}$	$L_{AI(Inst)}$
$L_{VS(Inst)}$	$L_{VF(Inst)}$	$L_{VI(Inst)}$
L_{AST3}	L_{AFT3}	L_{AIT3}
L_{VST3}	L_{VFT3}	L_{VIT3}
L_{AST5}	L_{AFT5}	L_{AIT5}
L_{VST5}	L_{VFT5}	L_{VIT5}
$L_{Apk(Peak)}$	$L_{Vpk(Peak)}$	

Available only for Display as Numbers or Spectra (Octave or 1/3-octave band):

$L_{XY(SPL)}$ $L_{XY(Inst)}$

The broadband Level Distribution, Cumulative Distribution and statistics L_{XYN1-5} are based upon sampling $L_{XY(Inst)}$ every 10 ms into 0.2 dB wide classes over a range of 80 dB
The octave or $^1/_3$-octave Band Level Distribution, Cumulative Distribution and statistics L_{XYN1-5} are based upon sampling $L_{XY(Inst)}$ every 100 ms into 1 dB wide classes over a range of 80 dB (BZ 7206 only)

Fast Logging: LAF(Inst.) can be stored every 100 ms during background logging and/or during event logging (BZ 7206 only)

Calibration:

External (Acoustic): Using the Multifunction Acoustic Calibrator Type 4226, Pistonphone Type 4228 and Sound Level Calibrator Type 4231
Internal (Electrical): Uses internally generated electrical signal combined with keyed-in value of microphone sensitivity
Initial Calibration: Stored for comparison with later calibrations
Initial factory calibration traceable in conjunction with ISO 9001 certification

CIC (Charge Injection Calibration)(BZ 7206 and BZ 7210 only): Injects internally generated electrical signal in parallel with the microphone diaphragm

- A reference CIC is done automatically during External or Internal calibration and stored for later comparison with a new CIC
- A manual CIC can be done whenever no measurement is in progress
- An automatic CIC can be part of a logging measurement, where the CIC can be set to occur up to 4 times in each 24 hr period
- An automatic CIC starts at a “logical” break in a logging measurement

Preset Time:

Selectable preset measurement time in the range 1 s to 99 h:59 m:59 s with 1 s resolution

Measurement Control:

Measurement functions:

- *Manual* – manually controlled single measurement
- *Automatic* – with pre-set measurement time from 1 s to 100 hours in 1 s steps (BZ 7210 and BZ 7219 only)

- *Sequence* – repetition of a single measurement up to 9999 times (results stored with or without statistical data). Measurement time selectable from 1 s to 100 hours in 1 s steps (BZ 7206 only)
- *Logging* – a single measurement with a selectable duration of 1 s to 100 days in 1 s steps. Logging duration divided into logging intervals of 1 s to 100 hours in 1 s steps. 15 different sets of parameters are available for storage
- *Logging with Events* – as Logging, but with the ability to measure a different set of parameters and timebase when an event trigger is recognised (BZ 7206 only)

Broadband Logged Parameters:

The following broadband parameters may be stored for each logging interval: All, Without Statistics, Major Parameters, Nothing
Major Parameters are the following

L_{Aeq}
$L_{Cpk\ (MaxP)}$*
L_{AFMax}
L_{AFMin}
L_{Ceq}*
L_{Alm}

Spectrum Logged Parameters:

The following Spectrum parameters may be stored for each logging interval: All, Without Statistics (BZ 7206 only), L_{eq}, Nothing

Elapsed Time:

When not in Logging function, elapsed time resets/starts and pauses/continues according to the respective command. In Logging function, elapsed time continues in real-time, regardless of pauses in a measurement

Triggers (BZ 7206 only):

Four types of event trigger are available:

- *Level* – monitors LAF(Inst) every 1 s. Event triggered when LAF(Inst) exceeds the set level for set period (both user-defined for 1 dB/1 s increments)
- *Softkey* – using < Start Event > and < Stop Event > softkeys
- *External* – + 5V on pin 9 of serial interface
- *Remote* – start and stop commands sent over the serial interface

All triggers can have pre- and post-trigger time intervals of up to 15 s (in 1 s increments) allocated to them

Timers:

Up to nine independent timers can be specified. Each timer "wakes-up" the analyzer at a specified date and time and performs a measurement procedure in accordance with user-defined set-ups. A timed measurement can be repeated 1 to 999 times. Timers from different types of application software can be mixed

Back Erase:

Data from the immediately previous 1 to 15 s can be erased from the measurement. All processed data (L_{eq}, L_N etc.) are then corrected accordingly (not available during logging)

Markers:

One data exclusion marker and four user-definable markers for on-line annotation of sound categories heard during the measurement (logging only).

Markers can be edited, while measuring, up to 60 s after the sound is heard (BZ 7206 only)

Control Of Sound Recording:

Sound recording (.wav files on a PC using 7815, 7820 or 7825) can be controlled from 2260 via RS–232 interface and Aux. output connected to the sound card on the PC

Markers and Events (BZ 7206 only) can be used to control recording on the PC

Measurement Displays:

The measurements can be displayed in six different ways:
Sound Level Meter: One main and five secondary parameters can be specified by the user plus one analogue bar (which can be zoomed)
Cumulative Distribution: For one of the octave (BZ 7206 only) or $^1/_3$-octave (BZ 7206 only) bands or broadbands plus one analogue bar
Level Distribution: For one of the octave (BZ 7206 only) or $^1/_3$-octave (BZ 7206 only) bands or broadbands. Class width can be specified. Y-axis can be zoomed. Also with analogue bar
Profile: The last 15 s of $L_{AF(Inst)}$ plus one analogue bar or the last 60 s with markers for logging measurements
Spectrum: Octave or $^1/_3$-octave band spectrum plus two broadband bars plus one peak bar. Y-axis can be zoomed and display window moved up and down
The four graphical displays have cursor read-out facilities
Automatic CIC: Viewed during or after the measurement (BZ 7206 and BZ 7210 only)

* $L_{Lpk\ (MaxP)}$ or L_{Leq} if L is selected in Broadband Frequency Weighting set-up

Statistics:

Cumulative Distribution: Curves displayed with 0.2 dB class interval
Level Distribution: Curves displayed with a user-defined class interval of 1, 2, 5, 10 or 20 dB

Modes:

The four main modes are:
System: (Platform only) used to set the internal clock, copy files etc.
Set-up: Used to set up measurement and control parameters
Calibrate: Used when calibrating the analyzer
Measurement: Used to view current and recalled measurements

GPS Data:

A position can be attached to a measurement by inputting data from a GPS (Global Positioning System) receiver via the Serial Interface
Receiver Standards Supported: NMEA 0183 ver. 2.20, optional corrected to Differential GPS using RTCM 104 ver. 2.1
Baud Rate: 4800

Storage System:

Internal disk for storing application software, user defined set-ups and measurement data. Set-ups and data can be recalled for further analysis
External Memory Card: For store/recall of measurement data and transfer of data to and from a PC (SRAM or ATA flash cards)
MS-DOS®: Compatible file system (from ver. 3.3)

Serial Printer/Output:

Set-ups and measurement data can be printed on an IBM Proprinter (or compatible) or a Graphics Printer Type 2318 or Portable Printer Type 2322. The formats can be screen dumps or tables
Measurement data can be output in spreadsheet format or as a binary file for post-processing on a PC

Remote/Local:

Remote control of set-ups and measurements as well as transfer of measurement data in binary form to a PC for use with Brüel & Kjær application software
Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400 and 115200

Help:

Concise context-sensitive help for keys and menus

Languages:

All software available in English, German, French, Italian, Spanish and Czech

Display:

Update Rates:
Discrete parameters: Every second
Analogue bars: 15 times per second
Spectra: 1 or 15 times per second depending on selected parameter

Auxiliary Outputs:

Can be set to:
LAF(Inst.) 0 to 4 V DC signal updated every 100 ms
Reference: 4 V square-wave for output calibration
Meas. Status: For triggering external devices during measurements (including SONY® TCD–D7/D8 and TCD–D100 DAT)
"Input": Frequency-weighted analogue signal with adjustable gain for aural monitoring or tape recording. Aux. 1 is C or L weighted and Aux. 2 is A weighted
"Event": As "Input", but only during events (BZ 7206 only)
Event Status: As Meas. Status, but only during events (BZ 7206 only)
Limited Event status: As Event Status, but with a maximum specified duration (1 s to 100 mins) (BZ 7206 only)

AC Inputs/Outputs:

Signal Output: Buffered, unweighted microphone
Signal Input:
Normal: For input from an external source such as a tape recorder
Hand Arm Vib.: For use with the 3-channel Human Vibration Front-end WB 3461 – special readings of a_{hw} in m/s^2 in the Spectrum display
Whole Body Vib.: For use with the 3-channel Human Vibration Front-end WB 3461 – special readings of a_{wx}, a_{wy}, a_{wz} and a_v in m/s^2 in the Spectrum display

Digital Audio Input/Output:

Not used with this software

Settling Time:

From Power On: Approx. 35 s

Effect of Vibration:

Less than 72 dB for a 50 Hz vibration at a level of 1 m/s^2

Effect of Accessories:

See Fig. 8.13, 8.14, 8.15 and 8.16 for the effect of accessories on the analyzer

Effect of Magnetic Fields:

80 A/m (1 Ørsted) at 50 Hz causing a reading of:
A-weighting: < 20 dB
C-weighting: < 30 dB
63 Hz Octave-band filter: < 30 dB

Batteries:

Type: 6 × LR14/C-size 1.5 V alkaline
Lifetime (at 20°C): 5 – 9 hours continuous use (decreases significantly at low temperatures)

Weight:

1.2 kg including batteries, Input Stage ZC 0026 and Prepolarized Free-field ½″ Microphone Type 4189

Dimensions:

375 × 120 × 52 mm including Input Stage ZC 0026 and Prepolarized Free-field ½″ Microphone Type 4189

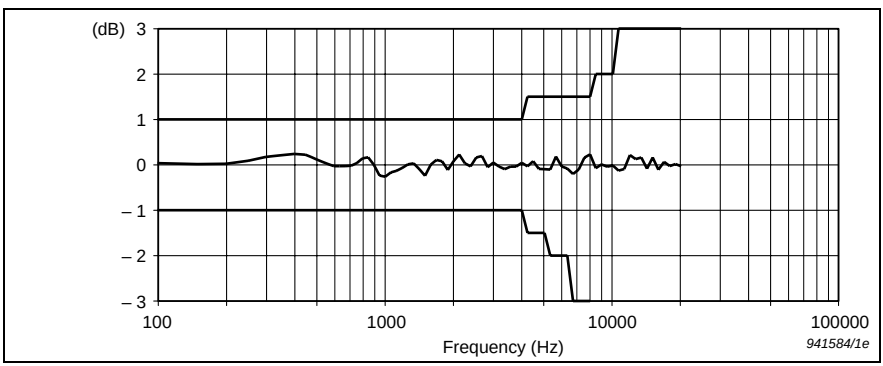

Fig. 8.1 Effect of the analyzer's casing on frequency response. Mask shows IEC Type 1 tolerances

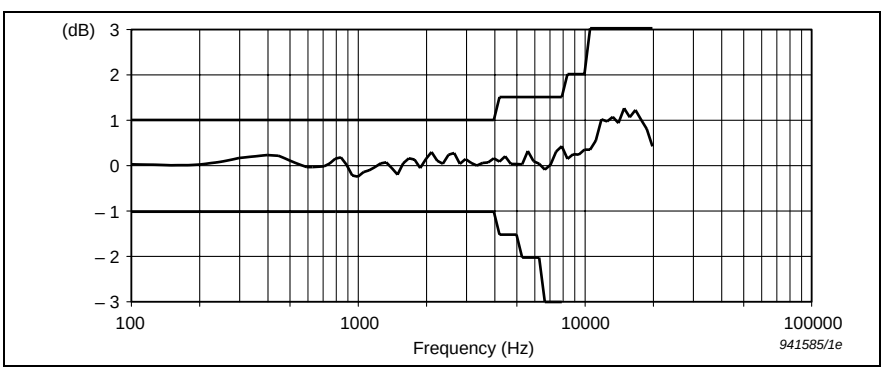

Fig. 8.2 Free-field frequency response of analyzer fitted with Prepolarized Free-field ½″ Microphone Type 4189. Mask shows IEC Type 1 tolerances

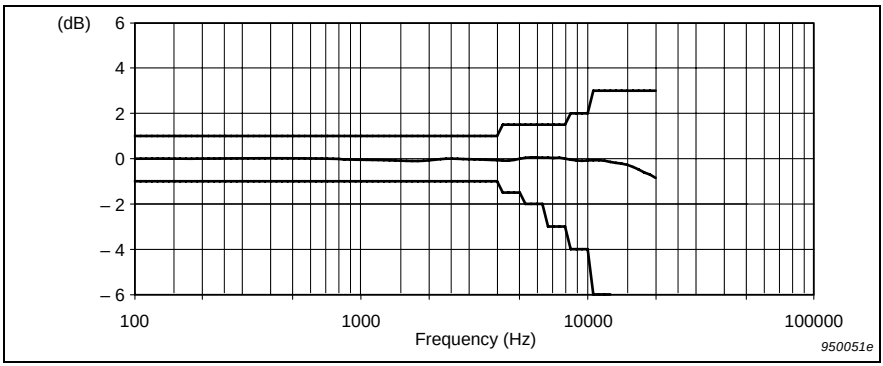

Fig.8.3 Random-incidence frequency response of analyzer (random incidence filter selected) fitted with Prepolarized Free-field ½" Microphone Type 4189. Mask shows ANSI Type 1 tolerances

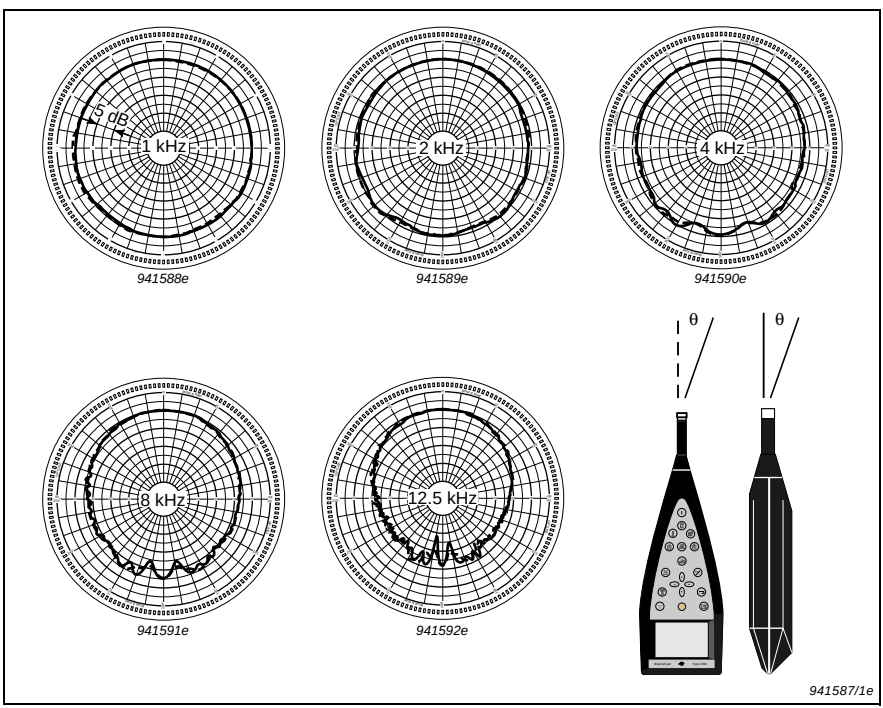

Fig.8.4 Directional characteristics of the analyzer fitted with Prepolarized Free-field $^1/_2$" Microphone Type 4189 at 1, 2, 4, 8 and 12.5 kHz

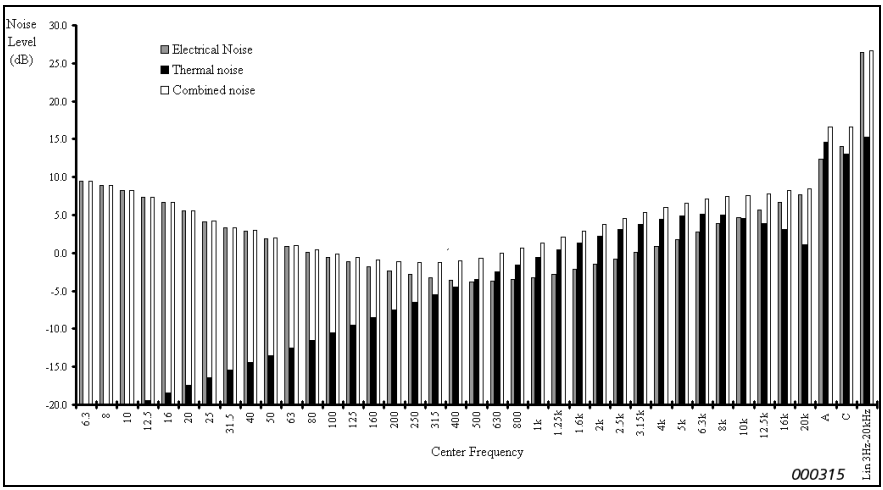

Fig. 8.5 The three components of inherent noise in each $^1/_3$-octave band and in the broadbands A, C and Lin (3 Hz – 20 kHz)

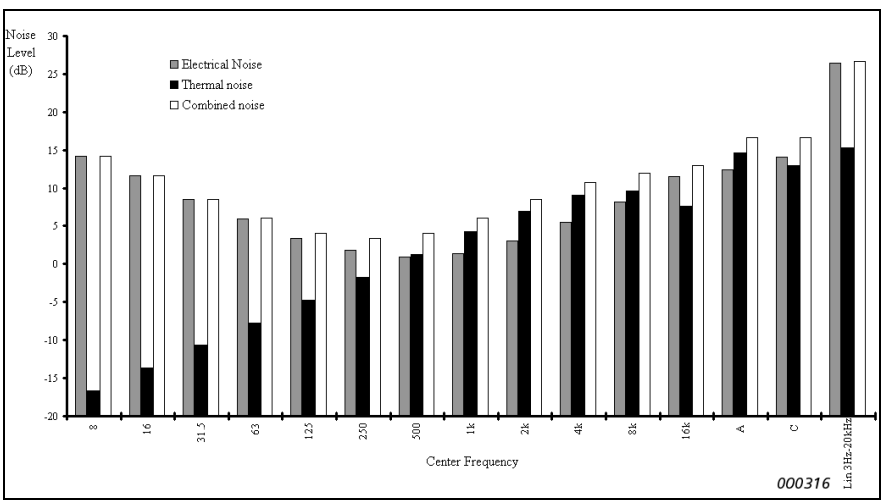

Fig. 8.6 The three components of inherent noise in each octave band and in the broadbands A, C and Lin (3 Hz – 20 kHz)

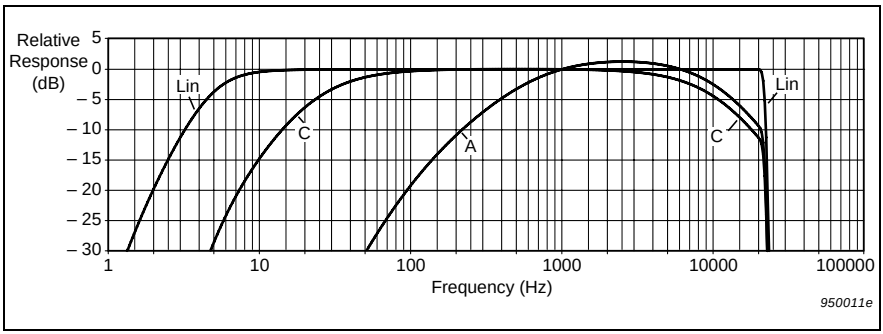

Fig. 8.7 Curves for the A- and C-weightings as well as the Lin. response. These curves do not include the response of the microphone

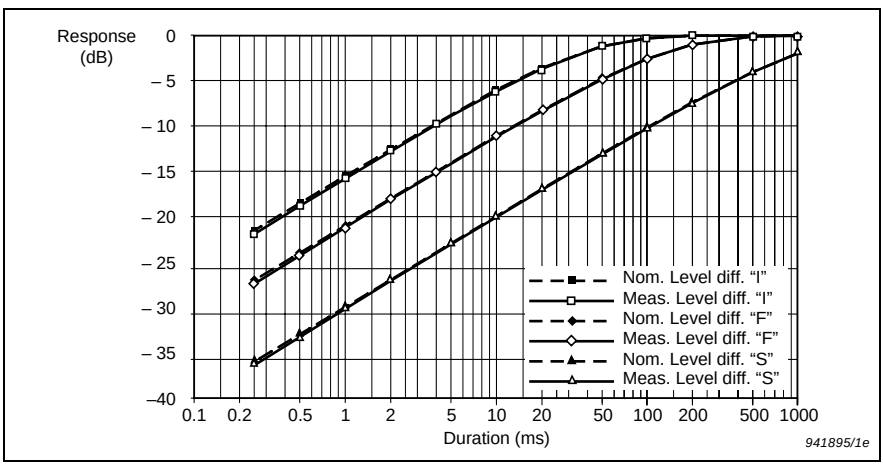

Fig. 8.8 Curves showing the detector response of the analyzer to 4 kHz tone bursts of various duration

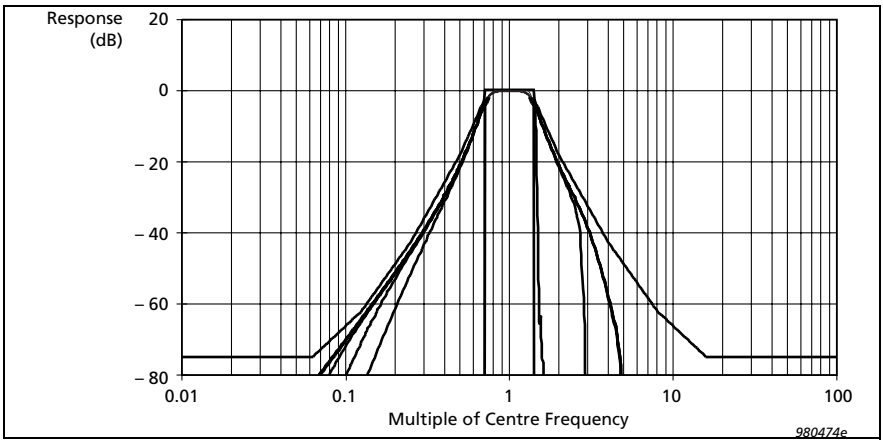

Fig. 8.9 Curves showing the shapes of the octave-band filters (from 0 to –80 dB). The innermost and outermost curves show IEC 61260 tolerances

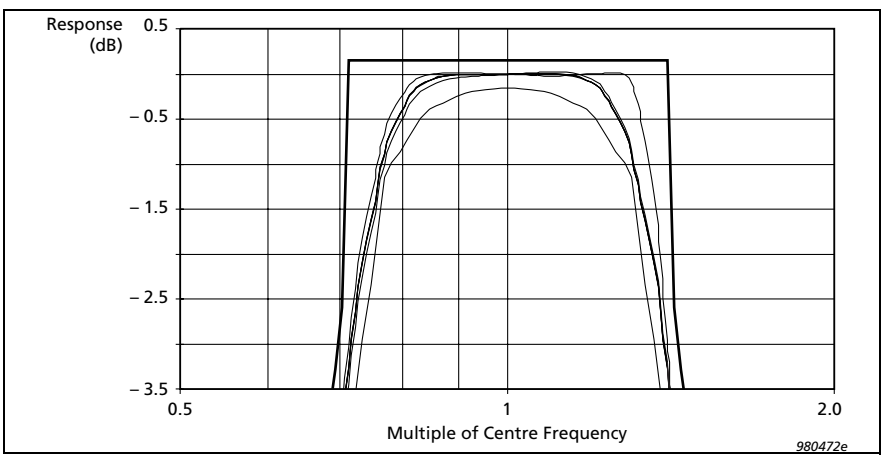

Fig. 8.10 Curves showing the shapes of the octave-band filters (from 0 to –3.5 dB). The innermost and outermost curves show IEC 61260 tolerances

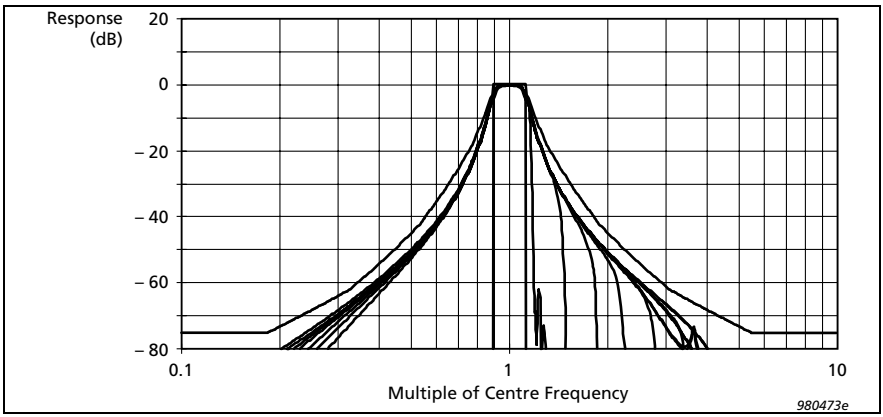

Fig. 8.11 Curves showing the shapes of the 1/3-octave band filters (from 0 to –80 dB). The innermost and outermost curves show IEC 61260 tolerances

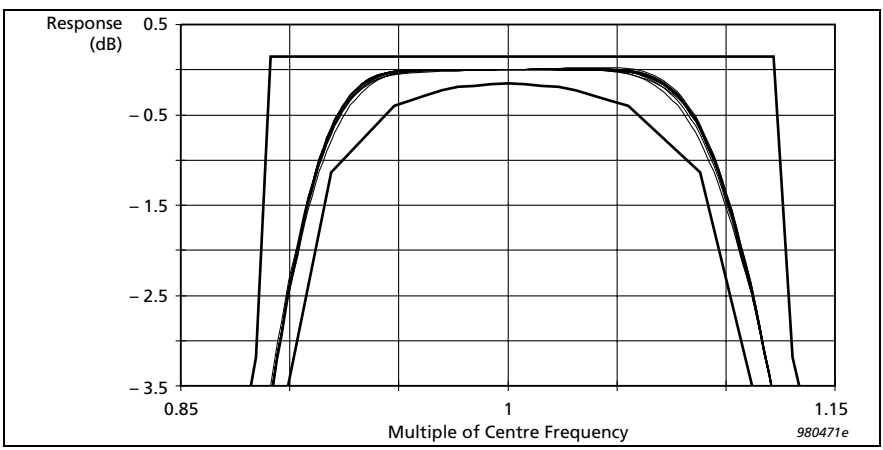

Fig. 8.12 Curves showing the shapes of the 1/3-octave band filters (from 0 to –3.5 dB). The innermost and outermost curves show IEC 61260 tolerances

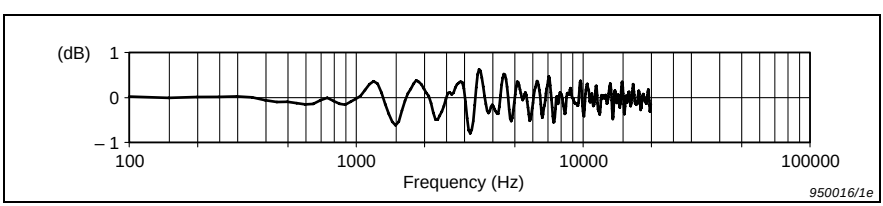

Fig. 8.13 Effect of accessories on the analyzer, here the Tripod UA 0587

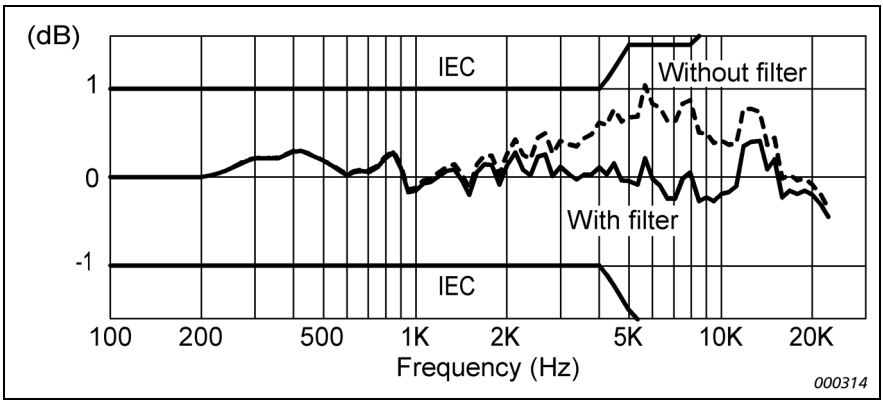

Fig. 8.14 Effect of accessories on the analyzer, here the Protective Cover UA 1236 for the microphone, together with the windscreen correction set to Protective Cover. Mask shows IEC Type 1 tolerances

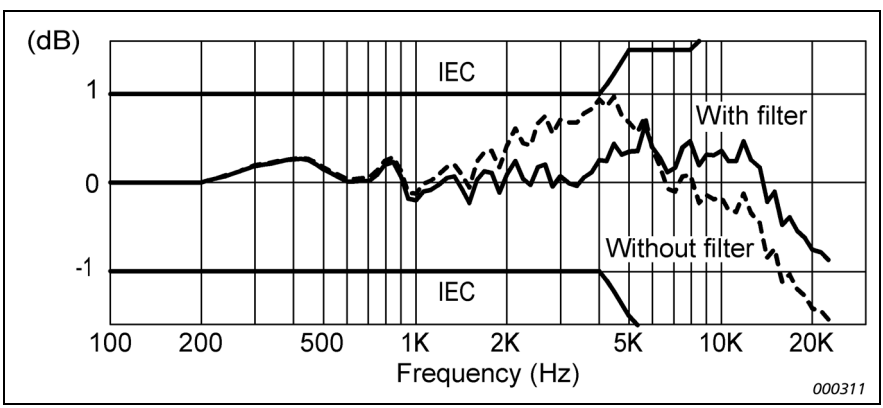

Fig. 8.15 Effect of accessories on the analyzer, here the 65 mm Windscreen UA 0459, together with the windscreen correction set to 65 mm. Mask shows IEC Type 1 tolerances

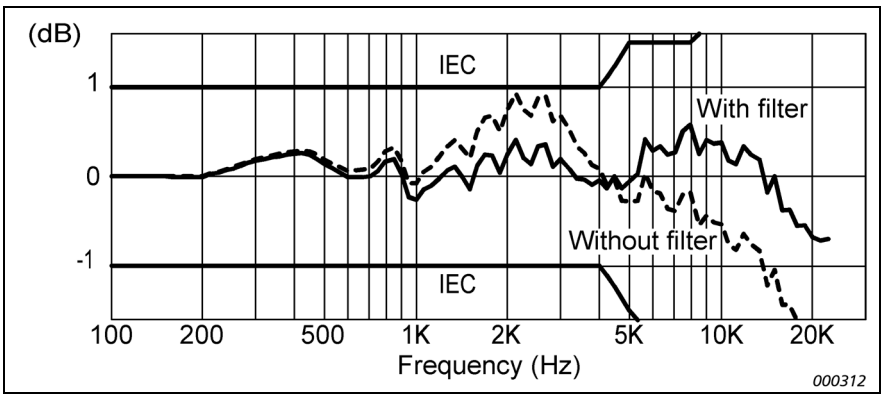

Fig. 8.16 Effect of accessories on the analyzer, here the 90 mm Windscreen UA 0237, together with the windscreen correction set to 90 mm. Mask shows IEC Type 1 tolerances

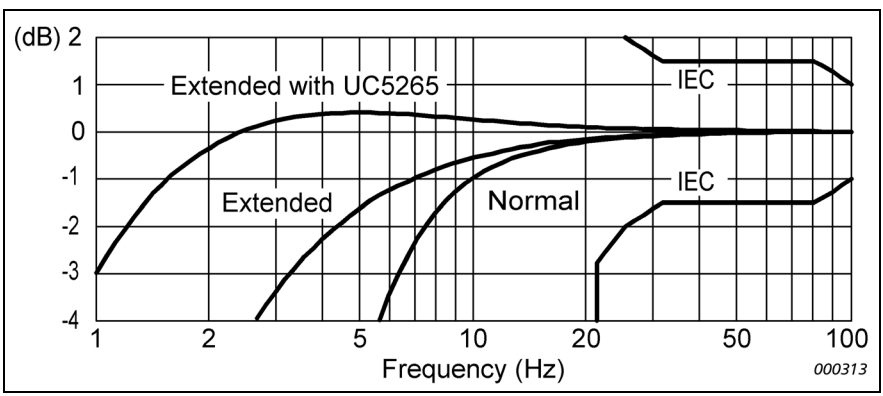

Fig. 8.17 Low-frequency response of analyzer fitted with Prepolarized Free-field ½" Microphone Type 4189. Normal setting, extended low-frequency setting and extended low frequency setting when the optional accessory UC 5265 is fitted between the microphone and the input stage ZC 0026. (Note: UC 5265 damps approximately 0.5 dB, please re-calibrate before usage.) Mask shows IEC Type 1 tolerances

8.2 Compliance with Standards

CE, C-Tick	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand
Safety	EN 61010–1 and IEC 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL 3111–1: Standard for Safety – Electrical measuring and test equipment
EMC Emission	EN 50081–1: Generic emission standard. Part 1: Residential, commercial and light industry. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Class B Limits. **Note:** the above is only guaranteed using accessories listed in these Specifications.
EMC Immunity	EN 50082–1: Residential, commercial and light industry. RF immunity implies that sound level indications of 40 dB or greater will be affected by no more than ± 0.5 dB. EN 50082–2 (1995): Industrial environment. RF immunity implies that sound level indications of 55 dB or greater will be affected by no more than ± 0.5 dB. **Note:** the above is only guaranteed using accessories listed in these Specifications.
Temperature	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: < 0.5 dB –10°C to +50°C (+14°F to +122°F) Storage Temperature: –25°C to +70°C (–13°F to +158°F)
Humidity	IEC 60068–2–3: Damp Heat: 90% RH (non-condensing at 40°C (104°F)) Effect of Humidity: < 0.5 dB for 30% < RH < 90% (at 40°C (104°F) and 1 kHz)
Mechanical	Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s^2, 10–500 Hz, IEC 60068–2–27: Shock: 1000 m/s^2 IEC 60068–2–29: Bump: 1000 bumps at 250 m/s^2
Calibration	Initial factory calibration traceable in conjunction with ISO 9001

Note:
The EMC standards prescribe tests with cables connected to all inputs and outputs. That is:

- Two AO 0440 BNC to LEMO cables, connected to AC I/O 1 and AC I/O 2
- Two AO 0440 BNC to LEMO cables, connected to Aux. Output 1 and Aux. Output 2
- One AO 1442 Serial Communication Cable
- One AO 0441 3m OR one AO 0442 10m Microphone Extension Cable
- External AC/DC Power Supplies Brüel & Kjær ZG 0386/7/8

EMC standards are not guaranteed to be fulfilled with cables and power supplies other than those mentioned above

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Chapter 10

Fold-out Menu Overviews

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10.2 Platform Menus ... 190

10.1 BZ 7206, BZ 7210 and BZ 7219 Software Menus

Overviews of the menus for the BZ 7206/BZ 7210/BZ 7219 Sound Analysis Software are shown in fold-outs in Figs.10.1 and 10.2. These are:

- Set-up (Fig.10.1)
- Calibrate (Fig.10.1)
- Measurement (Fig.10.2)

10.2 Platform Menus

Platform menus are marked thus (†) and are independent of the software used with the platform.

Overviews of all platform menus are shown in the platform's user manual.

nalyzer on and off

ery
e Battery Voltage screen to check the e batteries

brate
e Calibration menu for calibrating r

em
e System menu for configuring the d installing application software

ll
e Recall menu for recalling data from r's internal disk or a memory card ory Card slot (28)

sfer
he selected data to the connected de- r or computer)

e
e Store menu for storing data on the nternal disk or a memory card in the rd slot (28)

ge
e Range menu for changing the an- asuring range

up
e Set-up menu for changing the an- -up parameters

se/Continue
current measurement or, if the an- Pause mode, continues it without

◂ ▾ Arrow Keys
field selector around the screen and ameters and fields for editing. Also us or long lists of items

asurement Results
he installed application's Display splaying measurement data

et/Start
current measurement data, sets the nternal buffer to zero and, restarts ement

p
help screen for the area of the ap- u are using. Help is also available

16 Display/Hide Menu
Displays the soft key menu in either short or long form

17 Soft Keys
Activate application menus and options

Display

18 Display
Shows application, set-up screens and measurement results

19 Soft Menus
Show the effect of pressing the soft keys

Sockets

20 Digital Audio Input
Not used

21 Auxiliary Output 1
00-series 3-pole LEMO socket for output of software-determined signals. Can be used, for example, as a signal generator or for recording signals on a level recorder

22 Auxiliary Output 2
Second Auxiliary Output socket

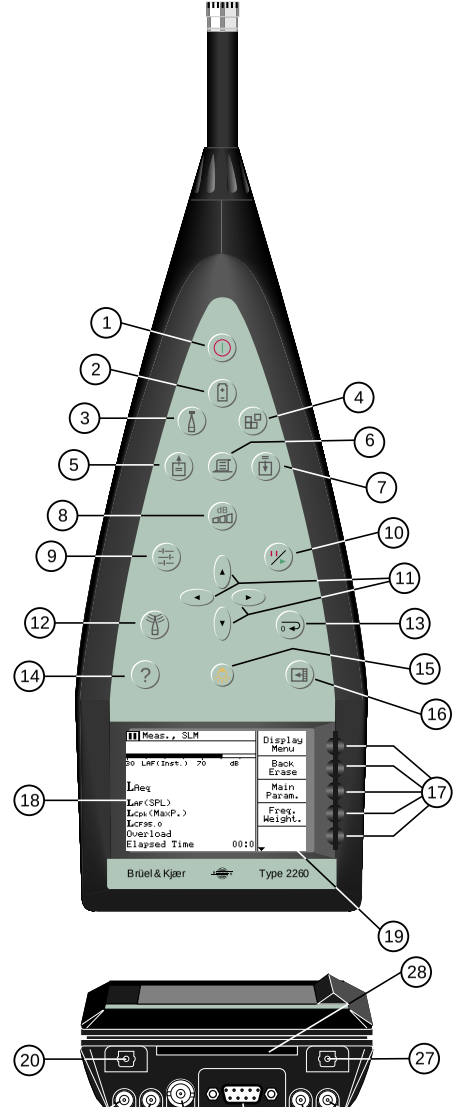
23 External Power
Input socket for external 10 to 14 V power supply

24 Serial Interface
9-pole male serial interface socket for transferring data to printers and computers and for remote-controlling the analyzer from a computer

25 AC Input/Output 1
00-series 3-pole LEMO socket for input or output of AC signal. In output mode, can be used for recording signals on a DAT recorder or analyzer, or with headphones. In input mode, can be used when analysing electrical signals, for example recordings from a DAT recorder

26 AC Input/Output 2
Second AC Input/Output socket

27 Digital Audio Output
Not used



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